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Articles

INFECTIOUS MONONUCLEOSIS[1]

A Review of the Condition as Seen in the Royal Navy

By

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GLANDULAR FEVER appears to have been first mentioned in the Royal Navy in 1931 when one case was recorded in the Home Fleet. No further cases were mentioned until 1934 when a case also at home was diagnosed. In 1935 there were 2 cases, 1 in the home station and 1 in China; in 1936 4 cases (1 at home and 1 in China) and in 1937 4 cases (3 at home and 1 in the Mediterranean). After this the condition became progressively more frequently diagnosed, though exact figures for the war years when of course the population at risk was greatly increased are not available. This increase has in the main continued until at present it has come to rank second only to tuberculosis amongst the zymotic infections if we exclude the common cold and influenza groups as Table I shows.

Even allowing for better facilities in diagnosis and a greater awareness of the disease this increase is truly remarkable and the purpose of this paper is to review glandular fever as seen in the Royal Navy at home during the years 1948 to 1953 inclusive, considering all aspects of a disease which already ranks as a major factor in the wastage of man hours. The condition appears to be much more prevalent at home than abroad and ashore than afloat; this last fact may be due to the younger and more susceptible age groups being employed ashore for training.

ÆTIOLOGY

Age.—Originally glandular fever was considered a disease of childhood but there seems during the past few decades to have been an increased tendency for adults to be affected. In the isolated community of the Falkland Islands Moir (1930) found that 10 per cent were aged between 15 and 65. The youngest recorded appears to be 7 months (Davis, 1929).

[1] Reprinted from the *Proceedings of the Royal Society of Medicine* 47, No. 9, 1954, by kind permission of the Editors.

In the present series the age incidence is as follows

Age	Number of cases	Age	Number of cases	Age	Number of cases	Age	Number of cases
15	10	22	30	29	3	[illegible]	1
16	9	23	26	30	1	[illegible]	1
[illegible]	12	24	17	31	1	38	1
18	45	25	10	32	1	39	1
[illegible]	84	26	4	33	0	40	1
[illegible]	12	27	5	34	1	41	1
[illegible]	64	28	6	35	1		

This series represents a selected age group in that children under [illegible] included and adults over the age of 45 only a present a small proportion of the total cases allowing for this over 80 per cent fall within the 18 to [illegible] group

Seasonal Incidence.—The monthly intake of cases was as follows

[illegible]	37	April	29	July	42	October	45
[illegible]	41	May	42	August	29	November	42
[illegible]	11	June	48	September	36	December	41

The figures for July August and September are lower than would be the case if the Navy population was quite constant as many ships are away from port on cruises and exercises and the summer leave is given during this period The sea going ships represent a variable but small proportion of the population from where these cases are drawn but it is possible that the population at risk may be some 20 per cent to 25 per cent lower during these months When allowance is made for this the highest incidence occurs during the summer months except for the month of February which for some reason shows a constantly high figure

Epidemiology and Infectivity

The causative agent is believed to be a virus which has not been isolated It is probable that the portal of entry is through the upper respiratory tract though ectopic entry through wounds may rarely occur Unlike homologous serum jaundice it does not appear to be transmitted by blood transfusion Attempts to transmit the virus to man or animals have not been very successful

Evans (1947) used 17 male volunteers aged 19–25 from an establishment where no glandular fever had occurred during the previous year and who had no history of the disease He used unfiltered throat washings serum and citrated whole blood and a careful check was kept but in no instance did a subject develop the disease though 4 showed slightly suggestive symptoms pharyngitis lymphadenopathy and lymphocytosis but the transient nature of these signs and symptoms and the absence of other supporting evidence make their occurrence only remotely suggestive of the transmission of infectious mononucleosis

Taken by and large then transmission experiments fail and it is clear clinically that the degree of infectivity is very slight It is quite exceptional for members of the household or close contacts to contract the disease

TABLE I.—ZYMOTIC INFECTIONS 1952–53

	3rd Quarter 1952				4th Quarter 1952				1st Quarter 1953				2nd Quarter 1953				3rd Quarter 1953				4th Quarter 1953			
	Home Shore	Home Fleet	Abroad	Total	Home Shore	Home Fleet	Abroad	Total	Home Shore	Abroad	Home Fleet	Total	Home Shore	Home Fleet	Abroad	Total	Home Shore	Home Fleet	Abroad	Total	Home Shore	Home Fleet	Abroad	Total
Diphtheria																								
Male	—	—	—	—	1	—	1	2		—	—	—	—	—	2	2	—	—	—	—	—		—	
Female	—	—	—	—	—	—	—	—	—	—		—	—	—	—	—	—	—	—	—		—	—	
Pertussis																								
Male	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—		—	—	1	1	—	2
Female	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Measles																								
Male	4	3	1	8	—	—	—	—	6	5	1	12	21	6	2	29	1	—	—	1	—	—	—	—
Female	—	—	—	—	—	—	—	—	3	—	—	3	3	—		3	—	—	—	—		—	—	—
Rubella																								
Male	42	23	1	66	21	4	—	25	53	5	—	58	245	78	1	324	58	11	3	72	6	5	—	11
Female	7	—	—	7	2	—	—	2	5	—		5	32	—	—	32	4	—	—	4	1	—	—	1
Glandular fever																								
Male	22	17	5	44	13	7	12	32	37	12	12	61	47	15	5	67	21	11	7	39	28	14	11	56
Female	5	—	—	5	6	—	1	7	8	—	—	8	1	—	—	3	5	—	—	5	6			6

Strength of		Home Shore	Home Fleet	Abroad	Total
June 1952	M	65 212	43 783	32 264	141 242
	F	4 487	—	230	4 497
December 1952	M	64 591	46 867	28 566	140 964
	F	4 684	—	254	4 977
June 1953	M	63 477	44 856	30 513	138 846
	F	4 572	—	350	4 922
December 1953	M	65 248	40 808	28 396	134 453
	F	4 443	—	363	4 806

Rates per 1 000		3 Qr	1 Qr	1 Qr	Qr	3 Qr	4 Qr
	Total	1882	1887	1883	1884	1883	1853
Rubella	M	0 47	0 18	0 41	0 3	0 52	0 08
	F	1 5	0 4	1 0	0 4	0 8	0 2
Glandular fever	M	0 31	0 15	0 43	0 48	0 28	0 42
	F	1 1	1 4	1 6	0 6	1 0	1 2

In the [illegible] approaching an epidemic occurred in any [illegible] or [illegible] the admissions being entirely random and roughly [illegible] and the only characteristic the figures show [illegible] the virus (Table II)

[illegible] 31

TABLE III

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	*Total*	*Year*	*Anginose*	*Febrile*
[illegible]	16	[illegible]	[illegible]	[illegible]	4	1948	28	13
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	89	1949	41	21
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4	1950	40	18
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11	1951	44	11
[illegible]	11	[illegible]	[illegible]	[illegible]	81	1952	41	22
[illegible]	11	[illegible]	[illegible]	[illegible]	113	1953	53	30
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	41		237	105

[illegible] of [illegible] is fairly static over the years and one [illegible] disease is becoming commoner amongst this particular [illegible] to be due to better diagnosis for the condition has [illegible] For the past twenty years there are no notable recent [illegible] diagnosis and the cases represent the work of numerous [illegible] Officers Nor is it due to an increased appreciation of the [illegible] first in cases of jaundice or with neurological signs [illegible] only distributed through the years under review It is [illegible] the disease now occurs more sporadically and less in [illegible] The condition started as a sore throat and cervical [illegible] but in 1930 there was a widespread epidemic in England [illegible] duration and the high percentage of adults [illegible] Since that time the disease has become commoner and [illegible] much more frequently diagnosed with a mild [illegible] In this series no one type predominated in any [illegible] of the anginose and febrile cases is shown [illegible]

[illegible] with minor variations the anginose cases remained [illegible] in the febrile group

There [illegible] many hints that evidence of subclinical infection is [illegible] contacts Hubrow *et al* (1943) investigated an outbreak in [illegible] L M S [illegible] in Scotland and examined 298 people both patients and staff Of these 47 9 per cent had evidence of the disease but of these only 125 had signs and 16 had suggestive blood or serological tests but no clinical signs Many cases were shown to exist in the near by town and other towns further away

Wechsler *et al* (1946) state that during the height of the epidemic almost every patient in hospital showed a varying percentage of abnormal lymphocytes in the smears

In the present series one is handicapped by the fact that the disease never took on an epidemic form and both the foregoing accounts deal with epidemics The problem then arose as to whether it was possible to demonstrate any rise

and fall in the mononuclear cells of the Service population corresponding with the frequency of admission. For this purpose the three years 1951-1953 inclusive at Portsmouth have been chosen as they contain the largest number of admissions. The laboratory at the Royal Naval Hospital Haslar serves the Portsmouth area and averages about 300 blood counts a month, the majority being patients in the hospital and a small proportion are cases referred from outside ships and establishments. The percentage of thin blood counts showing a mononucleosis of over 10 per cent. for each month of these three years has been worked out after discarding cases of blood disease and glandular fever (Table IV) the figures in brackets being the admissions of glandular fever to the hospital during that month.

TABLE IV.—PERCENTAGE OF BLOOD COUNTS SHOWING A MONONUCLEOSIS OF OVER 10 PER CENT.

Month	Year 1951 Per cent		Year 1952 Per cent		Year 1953 Per cent		Month	Year 1951 Per cent		Year 1952 Per cent		Year 1953 Per cent	
January	[illegible]	(3)	5	(4)	4	(1)	July	1	(7)	12.5	(7)	6	(6)
February	2	(5)	7	(2)	4	(6)	August	3.5	(1)	11	(5)	3	(1)
March	5.0	(2)	5	(5)	1	(9)	September	2	(1)	8	(5)		1
April	3.5	(1)	8.5	(3)	4.5	(2)	October	3	(4)	4.5	(5)	5	(3)
May	7	(5)	7	(5)	4.5	(1)	November	5	(6)	4	(4)	1	(4)
June	4	(8)	12	(4)	8.5	(6)	December	2	(1)	1.5	(2)	1	(2)

It was hoped that by studying the blood counts for each month from a random selection of probable contacts that some correlation with the incidence of the disease might be shown but it is obvious that there is none. This may be due to the disease not having acquired epidemic proportions and the number of admissions per month being too small to be reflected in the population at risk and in most cases the degree of contact was probably remote.

Between 2 per cent. and 12 per cent. of the blood counts show a relative lymphocytosis probably explained by the fact that the hospital population includes many cases of viral infection colds influenza virus chest diseases infective hepatitis and the like which may give a lymphocytosis. This may account in part for the higher percentages obtained in the first six months of the year and would tend to swamp smaller fluctuations carried by glandular fever.

The low rate of infectivity is also shown in the small number of medical personnel involved. There are no Medical Officers or Nursing Sisters in the present series and only 18 members of the Sick Berth Staff and 3 V.A.D. nursing members but 5 of the Sick Berth Staff were probationers having little or no contact with patients.

Pathology.—In most virus infections the disease process is much more widespread than was originally thought. For example poliomyelitis used to be regarded as a strictly neurotropic infection but an initial viraemic phase appears to take place in most viral illnesses and may involve most of the organs of the body. The same is true of glandular fever where not only the

hæmopoietic system is affected, but the nervous system liver skin eyes and many other systems (see Symptomatology). No biopsy material from lymph nodes liver spleen or other tissue is available from this series of patients but the main pathological facts are well known (Gall and Stout 1940)

The Blood Picture—This is characteristic and important All the hæmopoietic tissues are involved myeloid monocytic and lymphoid but at different times and to different degrees and can be best studied in the severe febrile illness Firstly the myeloid system is involved but less constantly or severely than the others in mild cases this response may be absent though it is often marked in severe illness During this invasive stage the polymorphonuclear count may rise to 80 per cent of a total white cell count of 30 000 (Whitby and Britton 1950) and the difficulty in diagnosis is obvious This rise in the granulocytes is usually transient but on rare occasions they may continue to rise until the fever subsides (Wintrobe, 1946) Occasionally myelocytes and granulocytes are present at the onset

The next stage is that of monocytic reaction which gives rise to a lymphocytosis with mononuclear cells forming 40 per cent to 80 per cent or more of the total white cell count occasionally this is delayed for a week or two during which time the blood picture may be normal but mononuclears usually begin about the fourth day and reach their peak about the beginning of the second week

An increase in lymphocytes occurs about this time but the monocytes settle first leaving a pure lymphocytosis

It will thus be seen that the blood picture is a very variable one and as Tidy (1950) remarks no single blood picture is exclusively typical of the disease

There are three types of mononuclear cells ordinary lymphocytes ordinary monocytes and abnormal cells, and the mononucleosis is mainly due to an increase in the last The abnormal lymphocytes are not specific for glandular fever they may occur in other virus infections such as infective hepatitis virus pneumonia rubella herpes or influenza but they are found much more frequently in infections mononucleosis than in any other condition They vary considerably in size and shape and have an oval or horseshoe shaped nucleus with a bluish grey cytoplasm which may contain azure granules, and may be regarded as primitive non invasive monocytes The total white cell count may be low, normal or high the increase is due to mononuclear cells and the height is roughly parallel to the fever The blood usually returns to normal within three months but may remain abnormal for as long as ten months In the case histories the differential white cell count is divided into polymorphonuclear cells (P) and lymphocytes (L) under which heading monocytes and glandular fever cells are included

The granulocytes are usually but little affected, in only 3 cases in this series were they markedly reduced

The total white cell count in this series was judged by the highest count taken during the first week of the illness (Table V)

TABLE V

Total white cell count	Cases	Total white cell count	Cases	Total white cell count	Cases
4 000–5 000	1	11 000–12 000	38	16 000–17 000	14
5 000–6 000	18	12 000–13 000	26	17 000–18 000	11
6 000–7 000	4	13 000–14 000	27	18 000–19 000	8
7 000–8 000	42	14 000–15 000	22	19 000–20 000	6
8 000–9 000	44	15 000–16 000	26	20 000–21 000	6
9 000–10 000	35	16 000–17 000	14	23 000–24 000	1
10 000–11 000	38				

Total 412

The majority fall between 5 000 and 11 000 that is the total count is usually but little raised

On the whole in this series the white cell count was lower in the first week tending to rise in the second or sometimes in the third week but it depended largely on the severity of disease and the pattern was very variable The 2 very high white cell counts are unusual both were angiose cases with cervical glandular enlargement

Eosinophilia.—Kaufman (1950) was struck by its frequency during the acute stage of his 82 patients 22 had an eosinophilia of over 5 per cent

In the present series an eosinophilia of over 5 per cent occurred in 11 patients 4 of them within forty-eight hours of admission and the remainder on the 5th 10th (2 cases) 13th 14th 21st and 35th days respectively

Eosinophilia during the latter stages of the illness and during convalescence is not uncommon in many acute infections and may be an expression of adrenocortical fatigue The red blood cells were altered very little The occasional patient showed some degree of anæmia during convalescence the only case showing an appreciable early anæmia being the Wren with an early purpuric rash mentioned later Glandular fever contrasts with leukæmia in this respect

In the few cases in which they were done the platelets bleeding and clotting time were little altered The blood sedimentation rate seemed surprisingly little raised though there were a few exceptions amongst the severely ulcerated throats

In the present series of 412 cases the Paul Bunnell was positive (1 64 or over) in 356 It was under 1 64 in 30 cases but in 12 of these the reaction was either 1 28 or 1 56 suggesting that the reaction might have become positive if done later In the remaining 26 cases the test was not performed

In about 70 per cent of cases the test was done during the first ten days and was often not repeated partly owing to the certainty with which the diagnosis could be made on clinical and hæmatological grounds and partly to spare the patient repeated venepuncture and the laboratory staff unnecessary work

Wassermann reaction.—The percentage of positive results is very variable Halerow *et al* (1943) report none Bernstein (1940) found it in 18 per cent and Tidy (1934) in 50 per cent It is usually weak and transient though Whitby and Britton (1950) report a case where it persisted for nine months in parallel with a positive Paul Bunnell

[illegible] Dupin the frequency of tests but [illegible] show a higher percentage [illegible] and the more accurate reading [illegible] results.

In the present series the Wassermann reaction was done at some time in the illness in approximately 95 per cent and of these 6 gave a positive result.

Negative results with syphilis are not in any case and a positive reaction only of [illegible] importance but it is of interest to note that the only [illegible] giving [illegible] one plus positive had a previous infection of syphilis.

SYMPTOMATOLOGY

Syphilis is [illegible] called as the great imitator and later in dates it is [illegible] the title. The list has grown further permutations such as [illegible] and several others have been included under this heading but they all have the common [illegible] that the disease process is a multisystemic [illegible] systems [illegible] affected but one may predominate and consequently the symptomatology is varied and diverse.

In glandular [illegible] only many different systems be affected but the [illegible] of the disease varies within wide limits.

Lily (1911) describes the clinical manifestation under three main headings [illegible] and adolescent types the anginosa type and the prolonged febrile [illegible].

In the present series the degree of overlap of symptoms was such that it [illegible] impossible to put cases into watertight compartments and it would [illegible] to study them under their various symptoms.

Incubation period is usually given between five and fifteen days. Only [illegible] in the present series gave a possible story of contact and probably [illegible] are helpful. A patient slept next to a case five weeks before and [illegible] patients girl friend is said to have had the disease four months previously whilst the third said his child had been ill with an elevated mouth [illegible] days before his symptoms began.

Prodromal symptoms were very common in many cases the illness had a [illegible] extending half an up to three weeks. 7 cases gave a history of tonsillitis [illegible] the illness [illegible] whether this represents an initiative phase of the disease and the main illness a recrudescence is problematical. In 1 case the attack came on [illegible] days after tonsillectomy. Headache was a common prodromal symptom. A patient had had an increasing headache for ten days before he reported sick. Malaise asthenia and easy fatigability came next followed by sore throat. A story of sweating at night for a few days prior to entry was common. One got the impression that the onset was usually more abrupt in febrile and anginose groups than in the glandular and abdominal types.

Sore Throat. This was the commonest symptom it being the leading complaint in 237 (51 per cent.) of the cases. All types were met with varying from mild faucial injection which was seldom absent to extensive involvement

of the fauces uvula and tonsils by œdema ulceration, sloughs and membrane formation

Next in frequency comes follicular tonsillitis Indeed this was the commonest single diagnosis on admission to hospital and there might be little to distinguish the case from the usual run of streptococcal follicular tonsillitis They mostly lasted about five to ten days it was unusual to get them persisting after this time

Sloughs ulcerated throats and membrane formations though less numerous than tonsillitis were far more striking Here again all degrees were met occasionally there would be only a shallow ulcer on one tonsil or ulceration might be extensive Healing was slower than in those with follicular tonsillitis The membrane may look exactly like diphtheria and in fact antidiphtheritic serum was given in 5 cases In one of my own cases that of a midshipman aged 20 extensive greyish white membrane covered both fauces and tonsils and stripped with difficulty leaving a raw area The breath was foul and cervical adenitis marked and tender and it was not till the blood count was done and two throat swabs had been reported negative for diphtheria that treatment by serum was abandoned It has been said that they lack the toxicity of diphtheria this is probably true as none of these cases were really toxic and the temperature is generally higher than one would expect with diphtheria

The membrane is said never to involve the larynx and no difficulty with respiration was met with in the present group

Œdema of the fauces was commonly combined with any of the above but never gave rise to anxiety and calls for no special comment

A generalized ulcerative stomatitis indistinguishable from a severe aphthous stomatitis occurred in 2 cases in 1 case it appeared as an initial symptom four days before the onset of sore throat and malaise which caused him to go sick

3 patients presented a picture of multiple purpuric spots in the mouth

Febrile Cases—105 cases approximately 25 per cent were admitted with flu like symptoms and in this group influenza or one of its synonyms was the commonest admitting diagnosis As a general rule sore throat glandular swellings and splenic enlargement were not marked but the group is a large and diffuse one tending to merge with the others They did however form diagnostic problems on admission before laboratory tests were at hand as there is little to lead one to suspect the correct diagnosis on routine examination

2 cases will serve to show the diagnostic difficulties of the febrile cases with few physical signs

Boy aged 16 went sick at 8 30 pm with a two days history of malaise and shivering but no sore throat and was thought to be influenza There were no abnormal signs but his temperature rose to 104° by 105 2° F and 102° by on the three nights following admission His white cell count was 10 600 P 85 L 65 and the Paul Bunnell positive to 1 3 554 On the third day a few small glands were palpable in the neck and axillæ but these were hardly in excess of normal and throughout his illness they were the only physical signs The fever subsided slowly over a fortnight

[illegible] n 21 4 50 [illegible] night sweats [illegible] and [illegible] Absorption [illegible] 1 in 28 [illegible] mononuclear cells [illegible] there was no palpable glands or enlargement of the liver or spleen

The duration of fever in all cases was very variable on occasions it was absent whilst other cases were characterized by a high swinging fever lasting up to twenty four days

Glandular Enlargement—Glandular enlargement was the leading symptom in 40 of the present series of cases just under 10 per cent All degrees were met with one case of the anginose type is described as having a bull neck though on the whole gross glandular enlargement was unusual Palpable glands thought to be pathological were present in all but 4 cases

The lymph nodes themselves were discrete elastic and moderately tender though this last feature was variable Palpable non tender glands can often be felt in normal individuals in the neck axillae and groins, especially if the subject is thin and allowance must be made for this for it is not always easy to be sure when these are pathological

Contratto (1944) out of 196 cases says that glands were never palpable in any other region when the cervical glands were not palpable This is not quite true of the present series where in 3 cases with glands starting in the groin no mention is made of cervical enlargement and in fact a purely inguinal form has been described by Chevallier (quoted by Bernstein 1940)

Several cases gave a history of cervical adenopathy as a prodromal symptom extending back even weeks before the onset of other symptoms and in a number of cases the glands only became enlarged in the week following admission Generally speaking they were enlarged on admission and subsided in line with the fever sometimes enlarging again if the fever rose The cervical group was by far the most commonly affected the two sides being about equal followed in turn by the axillary inguinal and epitrochlear glands

Nelan (1935) described a triangle of glands above the knee the nodal triangle which may be enlarged and tender on palpation and which when found is very suggestive of glandular fever there is no mention of this in the present series but obviously it was not specifically sought The glands never suppurate

The following 3 cases presented with glands in the groin

A Sergeant of Royal Marines went sick with a fourteen day history of swelling in both groins T 99° F W R and Kahn were negative and there was very little in the way of glandular enlargement elsewhere White cell count 14 100 P 8 L 92 and Paul Bunnell 1 in 1 792 1 in 896 after guinea pig kidney absorption and negative with ox cells

A K aged 20 reported sick on 18 6 52 complaining of a swelling in both groins He had no sore throat and no headache He was found to have a slight temperature and [illegible] inguinal glands Two days later he had a severe rigor and his white cell count was 9 700 P 28 L 72 and Paul Bunnell 1 in 896

S [illegible] aged 21 reported sick on 6 5 51 He had been struck on the shin twenty four hours beforehand the previous evening he had had a rigor and tender left inguinal glands Examination showed an abrasion on the left shin and tender glands in the

[illegible]

This last case is a very interesting one in the [illegible] diagnosis with the initial blood count and secondly [illegible] of the virus entering through an abrasion

Anderson and Cox (1947) described a case of a [illegible] 7 who developed inguinal adenitis five days after an abrasion [illegible] These were the only glands involved but the blood showed [illegible] lymphocytosis and the Paul Bunnell was 1 128 The incubation period is longer in this case than in ours but it does suggest that the infecting agent may gain access through portals of entry other than the throat and respiratory tract and although no focus was apparent in the other 2 cases presenting with inguinal adenitis an ectopic entry of the virus cannot be excluded

No case appears to have been described where the axillary glands alone are affected On 2 occasions patients were picked up on routine medical inspection with lymphadenopathy and found to have glandular fever though they felt well enough to continue work

Glandular enlargement may last a year or so (Tidy 1937)

Splenic Enlargement—The spleen was palpable in 75 cases or about 18 per cent but there is considerable variability in the figures from year to year one hospital for one year recording a 16 per cent enlargement [illegible] doubtless due to the diligence with which this symptom was sought by different Medical Officers of variable experience The incidence is usually put at about 50 per cent and it is said that the spleen may be palpable when no glands are felt Wechsler *et al* (1946) found it in 35 per cent of their 500 cases but said that it would no doubt be more if persistently sought

Enlargement is only moderate and tenderness slight and roughly parallels the lymph glands

Abdominal Symptoms—Exclusive of jaundice abdominal complaints occurred in 20 patients or about 6 per cent

(1) Nausea and vomiting as a prodromal symptom which had been present for some days before going sick, 2 cases One of these went on a drinking bout and had a hangover the next day with nausea and vomiting Both these symptoms continued for three days when a sore throat appeared which caused him to go sick

(2) Nausea and vomiting at the onset of the disease clearing during the first week 13 cases this was by far the commonest occurrence

(3) Nausea and vomiting in the second week 1 case

(4) Diarrhœa and vomiting 2 cases In the majority of cases constipation was the rule

(5) Abdominal pain [illegible] In 4 of these it was upper abdominal 1 generalized and in 2 in the right iliac fossa These 2 cases were sent in as observation appendicitis and [illegible] respectively

The cause of the abdominal pain is speculative the initial nausea and vomiting suggest a toxic reaction during the viraemic stage of the illness though hepatic involvement may play its part Early writers often mention enlarged mesenteric glands which are said at times to be palpable Post mortem studies are infrequent but Dolgopol and Husson (1949) describe a fatal case with neurological complications where autopsy showed congestive mesenteric glands which were not enlarged except for those round the head of the pancreas From the practical point of view it is important to differentiate these with abdominal pain from acute inflammatory conditions requiring operation

Liver Involvement Including Jaundice—Jaundice occurred in 16 cases (about 4 per cent) and hepatic enlargement is recorded in another 3 cases (about 0 7 per cent)

Many of the early reports dealing mostly with children describe liver enlargement and most series published since then mention it and jaundice in a small percentage of cases

The incidence appears to be very variable and it is a striking sign which cannot be missed so that thoroughness of examination does not play a part In this series the incidence was fairly evenly spread 1948—2 cases 1949—2 cases 1950—4 cases 1951 3 cases 1952—4 cases (different hospitals) and 1953—3 cases

Without reviewing the entire literature on the subject it can be said that in at least half the cases there are abnormal liver function tests Leibowitz (1953) found that the thymol turbidity was up at some point during the illness in 34 out of 25 cases and he concludes that hepatitis is an integral feature not a complication in most if not all cases of infectious mononucleosis As regards these liver function tests the colloidal gold and thymol turbidity indicate an alteration in the serum proteins albumin and fibrinogen being made in the liver and show a general disturbance of liver function whilst the alkaline serum phosphatase suggests impairment of hepatic parenchyma

The literature abounds with references to jaundice in glandular fever and as long ago as 1928 it was suggested that this was due to hepatitis and not to glandular obstruction at the portal fissure (Mason 1928) Subsequent biopsy and post mortem material has shown that the main lesion is a periportal hepatitis with mononuclear infiltration with some œdema of the sinuses and swelling of the cells of the smaller bile ducts

Leibowitz and Bently (1950) describe a case of cirrhosis following glandular fever as shown by biopsy They followed the case through chronic hepatitis to cirrhosis in three years the patient complaining of headaches anorexia indigestion and fatigue

Leibowitz (1953) reviews the literature and comes to the conclusion that in 1 962 cases there were 144 cases of jaundice an incidence of 4 9 per cent

In the present series jaundice appeared as an initial sign in 8 cases on the second day in 3 cases on the third day in 1 case on the fourth day in 2

cases and on the fifth and eighth days in 1 case each. In only 1 case did glandular enlargement follow jaundice. In 5 cases the jaundice was trivial and transient and in only 2 could it be termed severe. In 1 case no glands were palpable.

The main difficulty lies in diagnosis and suspecting glandular fever as a cause, and the following cases are recorded to illustrate these points.

Lieutenant Commander, aged 37. This Officer went sick on 17.5.54 complaining of headache and lumps in the neck. Clinical examination showed bilateral cervical enlargement with tonsillitis and marked cervical adenitis. His white cell count was 11,900, P. 58, L. 72. On 19th May general glandular enlargement was apparent and on 21st May he became jaundiced with bilirubin in the urine. Liver function tests, serum albumin, serum phosphatase 13 units, cadmium sulphate 3 units and serum cell and gall 14/420. The jaundice and the glands subsided during the next fortnight, but a month after admission his blood was still positive to W.R.C. 8,800, P. 24, L. 76. The interesting thing is that the Paul Bunnell was never positive throughout the course of the illness but was positive to Hughes' test. This serum agglutinin and tonsillitis are now absent but the liver abnormalities are apparent.

W.R.A., aged 21, went sick on 1.4.54 complaining of headache, anorexia, nausea and profuse sweating. On examination he was pale with a temp. of 104. Tonsillitis and moderate cervical adenitis were shown. The right base showed a dull note. His white cell count was 7,900, P. 16, L. 84. Paul Bunnell 1/896 and 1/448. He developed pyelitis and pneumonia. On 15th April jaundice appeared, reaching its maximum on the 18th, and the liver was palpable. The jaundice lasted for three days. On 19th April he developed a rash on the face, neck and trunk. The rash lasted for three days. On this girl, with a high swinging fever for more than three days and moderate pyrexia for a further three days, the possibility of Weil's disease rather than infectious mononucleosis.

Seaman, aged 19, admitted 7.7.54. His gave a history of cold in the head for a week. He had a fever, upset and then jaundice of eight days' duration. He was pale and jaundiced and the liver was enlarged, firm, tender, 4 cm. and palpable. The cervical glands, W.B.C. 10,200, P. 15, L. 85. Paul Bunnell positive 1/448 and 1/224 (absorbed). The jaundice was later in the jaundice. This type of illness is indistinguishable from infectious mononucleosis.

Leading Seaman, aged 21, admitted 10.7.54. He gave a history of a fever with chills and sweats. His history of malaria, heavy sweats and shortness and tiredness of eight days duration. He was admitted with a pyrexia and diagnosis of malaria. On the eighth day jaundice appeared, but failed to clear in five days. The white cell count was 15,600, P. 10, L. 90. Paul Bunnell 1/792 (unabsorbed), 1/896 (absorbed). On 15th July, three days after first seen in the dispensary, became worse. This progressive jaundice, 25th July, he had a very bad sleep, sighing, during the night, with marked cyanosis. Later, the liver became enlarged and tender. The spleen was not palpable. Although the tonsils were not inflamed, he complained of a sore throat. The jaundice was very deep, the urine was very dark, the stools were pale. The tongue was furred. The white cell count 21,100, P. 11, L. 89. Paul Bunnell 1/896. Serum bilirubin 8 units, serum phosphatase 13 units. W.R. negative. The patient died on 12th February, 1954, when he was the jaundice had cleared. Liver tested for [illegible]. This case illustrates the deceptive nature of prodromal symptoms and the relatively high temperature commonly seen in Weil's disease with which jaundice is complicated.

The [illegible] cases in any diagnostic problems on admission but the degree of [illegible] depend mostly on the throat where anginal symptoms are minimal the temperature is near normal and all parexial cases in this series had faucial involvement

The jaundice was never severe and it would seem that in glandular fever the gastro intestinal symptoms are less and the icterus milder than is usual in infective hepatitis

Spondic liver function tests done in the majority of these cases support the view that the jaundice is due to a diffuse hepatitis and obstruction of the bile capillaries There is no evidence that obstruction by glands ever plays a part

Rashes —Skin rashes were recorded in 34 cases or about 8 per cent and were made up as follows

Erythematous	3 cases	Papular	2 cases
Maculo erythematous	2 cases	Papulo vesicular	1 case
Macular rubeoliform	18 cases	Urticarial	3 cases
Maculo papular	2 cases	Type not stated	1 case

To this must be added one girl aged 19 who had a macular rash on admission and developed petechial hemorrhages on the ankles arms and neck on the third day and another patient who had a macular rash on admission but this faded within a few hours to be followed by a fine erythematous rash on the seventh day

Excluding these 2 cases the date of onset was

(1) Present on admission to hospital	16 cases
(2) Appeared on 2nd day	9 cases
(3) 3rd and 4th days	One case each
(4) 7th day	2 cases
(5) 8th 12th and 17th days	One case each

By far the greatest difficulty is excluding drug rashes In this respect the patient who developed a rash on the seventeenth day had been treated at the onset of his illness with chloramphenicol and the one whose rash appeared on the twelfth day had had sulphonamides a week before It may well be therefore that the incidence of recorded rashes is set rather high for in practice generally sulphonamides and antibiotics are freely given for septic throats and febrile illnesses It will be seen that by far the commonest combination was a morbiliform or macular rash appearing as one of the initial symptoms and the likeness to rubella was at times very close The rashes seldom lasted for more than a few days and were often gone by the next morning The incidence of rash seems to bear no relationship to the severity of the disease

The distribution of the rash was most commonly on the torso and proximal parts of the limbs the face was involved in 6 cases alone in 1 case

In this series the incidence of rashes was fairly evenly distributed over the years but judging from the literature the frequency seems to be very variable in the London Epidemic of 1930 almost all had rashes (Tidy 1934) Herpes has not been included in this group as it is not specific to the illness 2 cases

had labial herpes and in one case penile herpes two days before the onset of other symptoms

Chest Involvement —Cough usually mild was common 11 cases, or about 2 7 per cent are recorded as having signs those of bronchitis—universal rhonchi and scattered moist sounds—in 5 cases pain in the chest with localized pleural rub in 3 cases bronchopneumonia in 2 cases and right basal pneumonia in one case They were more frequent during the winter

The blood picture did not alter greatly except in the case with a right basal pneumonia he was admitted with a white cell count of 12 800 with 84 per cent polymorphs and it was the splenic enlargement which first attracted attention to the underlying pathology

The radiological picture conformed to what might be expected—an accentuation of the bronchovascular pattern in the bronchitics and patchy consolidation in the bronchopneumonics and in only one case was glandular enlargement noted and it would seem that it plays no part in these lung conditions

In none of these cases were pulmonary symptoms severe, and they mostly cleared within a few days

The Heart —In only one case in the present series was the heart queried, this patient had a transient apical systolic murmur and the electrocardiogram is reported as normal

In most cases the pulse rate paralleled the temperature but a relative bradycardia was common during convalescence A variety of abnormalities have from time to time been noted in the past mostly ECG changes alterations in rhythm transient murmurs and the occasional friction rub

There are several post mortem accounts showing mononuclear infiltration of the myocardium and it seems fair to summarize the position by saying that the heart is probably affected to a slight degree in many cases during the acute stage of the illness but that the working capacity of the organ is unimpaired and full recovery occurs

The Nervous System —The neurological manifestations of infectious mononucleosis are uncommon but very varied and have attracted a good deal of attention The incidence varies from 5 per cent to under 1 per cent in different series

Headache was extremely common and usually mild and is probably toxic or vascular in origin and combined with apathy irritability vertigo and somnolence It was usually frontal and far commoner in the early stages of the illness

One case became disorientated a boy of 15 who was admitted on 1 7 41 complaining of a sore throat and swollen neck His throat was very foul with marked cervical adenitis a few glands in the axillæ and groins and the tip of the spleen was just palpable White cell count 8 800 P 23 L 77 Paul-Bunnell 1 112 On 5th July he became rambling disorientated and incontinent, a situation which lasted for forty eight hours

Some degree of neck stiffness was common but seems to have been more

often due to other causes than meningeal involvement: no case really simulated meningitis and no case of serous meningitis occurred in this series.

3 cases (approximately 0.7 per cent) in this series gave clear cut evidence of nervous involvement and are worth while recording briefly.

Seaman [illegible] 1949 [illegible] first seen sick on 4.1.48 complaining of aching eyes, malaise, and photophobia. On 11.1.48 temperature of 104.1°, slight neck rigidity, tenderness in the right iliac fossa, enlargement of the cervical, occipital, axillary and [illegible] glands. A streptococcus (haemolytic group A) was isolated from the throat. White cell count 10,000, 46% [illegible], 6% [illegible], Paul-Bunnell 1/448. The meningismus cleared but the [illegible] remained worse over the next few days. On 14th January pain and [illegible] developed in the right iliac fossa and tumbler test on 19th January was positive. The right iliac fossa and [illegible] became more tender, and the patient was transferred to the surgeon. Appendicitis was diagnosed and the right iliac fossa was explored. The appendix was found to be normal, but there was a mass of the right colon and the adjacent part of the ileum. This was resected and the patient was finally discharged on 8th April 1948 with [illegible] residuals of the shoulder.

A localized neuritis of the shoulder girdle has been described during the course of a variety of maladies (Spillane 1943) and it may well be argued that there is no evidence of the glandular fever being specifically responsible.

[illegible] was admitted to hospital on 18th February 1952 with the following [illegible]

[illegible] 1951 [illegible] generalized headache which became slowly more severe. [illegible] a small skin rash followed by a feeling of fever. After this [illegible] the headache went but on 31.1.52 she began to feel weak in the legs. [illegible] days later there was weakness in the arms but no paresthesiae. [illegible] On admission there was symmetrical flaccid paralysis of all [illegible] in the legs and partial in the arms, though the abdominal and [illegible] were present. The abdominal reflexes and the tendon jerks were [illegible] the plantar responses were flexor. The white cell count [illegible] and the Paul-Bunnell 1/896. 1/224 after absorption with [illegible] with [illegible] cells. W.R. negative. CSF pleocytosis 62 [illegible] 1/3 lymphocytes. Lumbar puncture no change.

[illegible] of the thighs was possible through disuse. All the muscles [illegible] the abdominal muscles were normal. The upper limbs [illegible] (Wilson 1960, p. 43).

[illegible] 1952 [illegible] but in six months time to twelve months before [illegible]

[illegible] polyneuritis or the Guillain Barre syndrome [illegible] glandular fever, but it is of interest that neither the [illegible] nor the spleen were enlarged in this patient, nor was sore throat [illegible]

[illegible] already been reported in detail (Stride 1973): the patient presented with an epileptic fit and was found to have cervical adenopathy and typical blood changes. Subsequent EEGs were normal.

Convulsions in glandular fever have been recorded but are rare. Bercel (1952) reported 5 cases of infectious mononucleosis showing abnormal EEG tracings in 4 cases the picture returned to normal whilst the 4th had persistent abnormalities and later had a Jacksonian seizure.

The above cases show that the possibility of infectious mononucleosis should be borne in mind in any case of unexplained nervous disorder even

when sore throat, splenomegaly and glandular enlargement are absent. The diagnosis must rest on the blood findings and agglutination titre as the C.S.F. findings are extremely variable.

The Kidneys.—The incidence of renal involvement in different series varies. Bernstein (1940) had none. Tidy and Morley (1921) had 6 per cent. of 270 cases and Weckslee *et al.* report 3 per cent., chiefly albuminuria, increased cellular content and hyaline and granular casts in the first week of the illness subsiding in seven to ten days. 4 of their cases had macroscopic hæmaturia.

Again the frequency is likely to vary with the diligence with which it is sought, and albuminuria during the febrile stage is probably common, but in the present series there are only 2 cases.

The nephritis of glandular fever seems to carry an excellent prognosis.

Bleeding.—Various hæmorrhagic manifestations have been described from time to time: hæmaturia, rectal bleeding and hæmoptysis (Sears, 1949) and purpura (Magner and Brooks, 1942). Reference has already been made to petechiæ in the mouth.

Epistaxis occurred in 3 cases in this series, 2 of them within a day or two of admission, the 3rd on the twelfth day in hospital but whilst the throat was still swollen and œdematous when he had several severe bleedings.

There was one case of generalized purpura.

No case of rectal hæmorrhage, hæmoptysis or macroscopic hæmaturia occurred in this series.

Ocular Manifestations.—Mild eye complaints such as soreness, pain on eye movement, blurring of vision and photophobia were common in the initial stages.

3 cases had definite conjunctivitis, all within the first week of the illness and all mild. One patient developed an iridocyclitis as symptoms of the acute illness subsided. He complained of sore eyes and blurred vision and developed a low grade bilateral iridocyclitis with pigment spots in both lenses and fine dust like opacities in the media. He gradually improved over the next two months.

Although changes in the fundi are rare, one case had transient papilloedema.

The incidence of symptoms such as pain in the eyes and photophobia varies in different series from 1 per cent. to 40 per cent., they almost invariably occur in the early stages of the disease, are mild and are easily overlooked.

Œdema of the Face.—Facial œdema, especially of the eyelids, is mentioned in 6 cases. 4 of these were anginose cases with puffiness of the eyelids during the first two days. The other 2 had only slight involvement of the throat and of the cervical glands.

Lymphatic obstruction due to glandular enlargement does not appear to be a factor, as these cases show, nor does facial œdema necessarily occur in cases with marked cervical adenitis.

The œdema was never gross and subsided within a few days.

Relapses.—Recrudescences are common but all degrees of severity exist. If minor rises of fever with slight exacerbations are included, 42 cases or

about 10 per cent were affected in only 1 cases however could true relapse be said to occur and in only 1 case was there a history of a previous attack 3 cases may be summarized for purposes of illustration

When aged 20 was admitted on 11 1 49 complaining of fever and a sore throat. Glands were palpable in the neck axillæ and groins but there was no splenomegaly W B C 12 700 P 25 L 75 Paul Bennell 1 448 Recovery was uneventful and by 18 1 49 the patient was well again

On 18 2 49 her temperature rose again to 101 1 and the cervical and axillary glands enlarged and became tender but settled in three days

Male aged 19 admitted 30 11 51 complaining of swelling front of head and neck throat and vomiting Clinically there was general glandular enlargement but no palpable spleen W B C 13 400 L 28 L 72 Paul Bunnell 1 256

The fever continued for ten days and then settled and he returned to duty on 28 12 51

On 6 1 52 he was readmitted with a temperature of 103° L and all glandular groups including the epitrochlears were enlarged and tender W B C 8 000 P 32 L 68 On this occasion he ran a fever for sixteen days and then slowly returned to normal

Both these cases illustrate a relapse after a short period of apparent recovery

Sub Lieutenant aged 20 This patient was admitted on 20 6 49 with a provisional diagnosis of leukæmia the Medical Officer of his establishment having examined a blood smear

His previous history was that he had glandular fever in 1938 when aged 6 and again in 1943 when aged 14 The first was not proved haematologically and he is said to have run a fever for some days and to have had enlarged glands but on the second occasion he was at school where there was a mild epidemic and he went sick with tonsils in his throat but his blood examined and was labelled glandular fever

On admission he complained of malaise headache and lumps in the neck The cervical glands were markedly enlarged and the occipital and epitrochlear groups were palpable and tender W B C 8 400 L 28 L 72 Paul Bunnell 1 112 on admission

The rest of the illness was uneventful but the case is recorded as a probable second or subclinical attack of the disease

Convalescence —There are many references to a prolonged asthenia following glandular fever Isaacs (1948) describes 74 out of 216 patients in whom such symptoms as ease of fatigue exhaustion aching of legs weakness depression evening temperature palpable spleen low blood pressure and low blood sugar and abnormal lymphocytes in the blood persisted for a variable time afterwards even up to four years Children may take a long time to recover especially their powers of concentration Tidy (1950) has suggested this may be due to an encephalitis

In the present series by far the most protracted convalescence occurred in the case of acute infective polyneuritis described above where the best part of a year elapsed before full recovery was attained but 3 other cases remained debilitated for some months afterwards

On the whole, in this series dealing with healthy young adults a prolonged convalescence was not an outstanding feature it was the custom to grant a period of sick leave following the illness and the great majority were fit for duty on their return

Diagnosis

The diagnosis depends essentially on the examination of the blood, and the presence of several types of mononuclear cells and an increase in both

normal and abnormal monocytes, the rapidly changing blood picture and the absence of anæmia. All the same the initial polymorphonuclear response may cause difficulty.

Reference has already been made to vagaries of the Paul Bunnell and Wassermann reaction. Tidy (1950) has pointed out that a very difficult diagnosis is the rare slowly progressive chronic lymphatic leukæmia which in its early stages has periods of pyrexia with glandular swellings.

A complete differential diagnosis of glandular fever would involve a general survey of medicine, but a few comments call for special mention.

The Anginose Type.—Many cases are probably missed and pass off as mild sore throats, tonsilitis or Vincent's infection and can only be differentiated hæmatologically, but real difficulty may exist with diphtheria as mentioned above.

Jaundice.—Infective hepatitis may give a similar blood picture and a weakly positive Paul Bunnell only differentiated by absorption tests.

The febrile type may simulate undulant fever and typhoid very closely, the latter being a frequent diagnosis in the earlier epidemics.

Syphilis.—The secondary stage with fever, glandular enlargement and a rash, perhaps complicated by a false positive W.R., can be very similar.

The Exanthemata.—Many of these, influenza, whooping cough and mumps to mention a few, may have a lymphocytosis, but the most difficult is rubella, where enlarged glands and a rash complicate the picture.

The provisional diagnosis of these cases on admission to hospital represents the spot diagnosis made by the doctor who first saw the case, and covers a wide range. Several cases were first admitted to the Surgical Sections, chiefly on account of cervical or inguinal adenitis. Sore throat and its variants headed the list, followed by influenza, pyrexia of unknown origin or some similar suggestion. Glandular enlargements came next. Hodgkin's disease, tuberculosis, leukæmia and rather surprisingly in 2 cases, herpes. Rubella was the most commonly named exanthem, though 3 cases were sent in as mumps, a malady which should not cause confusion as the salivary glands are never enlarged in glandular fever.

Prognosis

In general the outlook is excellent, but allowance should be made for the variable duration of the illness, the possibility of relapse and prolonged convalescence. According to Lassen and Thomsen (1940) the disease may take on a malignant course and they quote a mortality of 1 per cent. to 2 per cent. in over 500 cases.

Numerous fatal cases have been reported. Leibowitz (1953) has collected 38 and they mostly fall into 2 groups, splenic rupture and respiratory paralysis.

Rupture of the spleen may occur spontaneously or during straining such as at defæcation.

Smith and Custer (1946) discuss this question and say that the capsule and trabeculæ are weakened and even broken up by cellular reaction, and that

by the third week this has progressed far enough to allow rupture and that the rate of increase in size is also a factor

Respiratory paralysis is a risk in cases involving the nervous system it is sometimes central and sometimes peripheral Pulmonary complications and toxæmia account for a few cases There were no fatal cases in this series in fact none gave rise to real anxiety Second infections are very rare one possible case is recorded in this paper

Prophylaxis

As the degree of infectivity appears to be very low and as the disease appears to be widespread it is pertinent to ask what prophylactic measures should be undertaken when dealing with cases a matter of considerable importance in the armed services where people live in Messes in close contact with each other

Tidy (1930) states that isolation should be carried out in accordance with the dictates of common sense for a disease which is undoubtedly infectious but only of a moderate degree of infectivity and with a favourable prognosis There are however a number of factors worth considering Very little is known of the duration of infectivity or the period of the illness when it is maximal though it is reasonable to suppose that it is most marked in the initial stages The anginose type which constitutes the largest single group may well be non infectious and nothing is known of the infectivity in relapse

The high incidence in the late teens and early twenties suggests that the illness mostly affects new entrants into the Service the older age groups being immune At the same time the steady trickle of cases from various ships and establishments suggests that the infection is universal and that symptoms appear in only a small minority of those infected In epidemic times the virus may assume an increased virulence and rate of incidence of symptoms but in normal times it is debatable whether anything is to be gained by isolation There is certainly much more justification for isolating infective hepatitis

Much must depend upon the circumstances existing at the time but there would seem little contra indication for nursing the febrile and glandular cases in the general wards and none to so treating the anginose cases Nervous and jaundiced cases can be treated without great risk in the medical wards where facilities for investigation and treatment are usually better

In practice cases are seldom diagnosed before entering hospital and have a variety of titles causing them to be admitted to different sections, those labelled Hodgkin's disease tuberculous glands of neck and lymphosarcoma for example find their way to the surgical wards and may need transfer but others admitted to the general wards are best treated there especially as a day or two commonly elapses before a positive diagnosis is made

Treatment

No drug is known to have any effect upon the causative organism Viruses are obligate intracellular parasites and in contrast to the protozoal and

bacterial infections specific treatment against the viruses has been exceptionally fruitless apart from the rickettsiae and the larger viruses of the psittacosis group

Sulphonamides are contraindicated on account of their depressant effect upon the granulocytes In this series they were frequently given but usually early in the disease before the diagnosis was established and as far as can be judged they had little effect on the subsequent white cell count

The literature on the use of antibiotics in this condition is considerable and all the common ones have been tried and found ineffective Amongst our patients penicillin aureomycin and chloramphenicol were given at different times to different patients without altering the course of the malady but of these penicillin was given by far the most frequently This subject has been fully discussed by Bennike (1951) who contrasts 99 patients treated with penicillin to 67 without it and concludes that it is hardly indicated though it may on occasions deal with secondary invaders

An interesting experiment was tried in Denmark by Jussen and Thomsen (1940) who gave intravenous specific convalescent serum to 12 cases and reported favourable results but the difficulties of obtaining the serum are obvious though it may be of value in dealing with the occasional severe case in an epidemic when convalescent cases are available

Antipyretics were commonly given especially on the onset of the disease when the fever was at its peak They serve no purpose and only increase sweating and prostration

ACTH and cortisone require special mention for although none of our cases was treated in this way there appear to be certain indications for their use

Doran and Weisberger (1953) describe the use of ACTH in an 18 year old man who was seriously ill with infectious mononucleosis—aureomycin was given for the first five days but was without effect and ACTH from the tenth to seventeenth day Rapid improvement took place coincident with the use of the drug and the authors conclude that although ACTH is not indicated for routine use in the condition further clinical trial in severe or complicated cases is necessary to evaluate its specificity and its effectiveness

The use of intravenous corticotrophin has also been tried in the Guillain Barre syndrome (Blood *et al* 1953 Newey and Lubin 1953) on the basis that this is an allergic reaction to a variety of different antigens Dramatic improvement followed but relapse occurred when the drug was discontinued but symptoms cleared again when it was re started

The average case mild or of moderate severity requires no treatment other than bed rest during the febrile stage and symptomatic treatment as the need arises In view of the excellent prognosis no specific treatment either by antibiotics or ACTH is called for If pathogens are isolated from the throat or if there are chest complications antibiotics are required and the drug of choice is penicillin Severe cases or those complicated by the Guillain Barré syndrome may be given ACTH with the usual precautions but its effect in this condition has still to be evaluated

In view of the effect upon the liver, and especially in cases complicated by enlargement of the liver or by jaundice abstinence from alcohol and perhaps a high protein diet should be encouraged on the same lines as for cases of infective hepatitis.

The disease is frequently debilitating and a long period of convalescence or restricted duty may be called for. Finally, where glandular enlargement has been gross it may take months to subside but this does not mean a persistence of the disease.

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MOTION SICKNESS

BY

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THOSE who go down to the [illegible] ships with [illegible] in the course of duty often go with a sinking heart. The inward [illegible] of the depths is reflected only too clearly in their inward disquiet and even the gentle breeze ruffles the calm of the bad sailor. Temperament determines whether abstinence, excess, stoicism or quaint charms are adopted. Many have come to trust an approved remedy but few consult a physician except to obtain the remedy in question. Most seafarers have their own ideas which they will stoutly defend

[illegible] but it is as well for medical men and especially those [illegible] to have some knowledge of the established [illegible] principle of treatment

The purpose of this article is to summarize the information at present available and to indicate the sources from which further details can be derived In comparison with the few effective measures for treating motion sickness the amount of literature available is prodigious Therefore an attempt will be made not to be exhaustive but rather to give a balanced outline of contemporary knowledge

Definition

The review of Tyler and Bard (1949) gives a clear and comprehensive account of the facts known until the beginning of that year Those writers point out that Irwin (1881) appears to be the first to have used the term motion sickness which embraces seasickness and allied disorders This term was widely used by Sir Frederick Banting to designate a disorder due to frequently repeated oscillatory movements of the body Motion sickness can be produced by road rail and air journeys which has led to the use of the term travel sickness but also in susceptible persons by swings and roundabouts lifts diving and riding horses or camels

Importance

The effective treatment of motion sickness is particularly important in naval medicine The incidence is widespread and leads to great loss of efficiency and even more important morale The old story that for the first hour the sufferer thinks he is going to die then fears he will not carries a warning of defeat for a fighting service At sea the increasing complexity of naval warfare new navigational aids precautions against atomic and gas attack and the vital necessity of keeping at sea in all weathers and at speed all accentuate the problem Ship's complements are increased whilst accommodation is reduced to house new equipment the upper deck is cleared and even the bridge discards below Confined spaces increase the incidence of motion sickness and overcrowding its demoralizing effect An sickness presents a high problem increasing with the growing emphasis on naval aviation These are important but the minor inconveniences of travel sickness of the funfair the theatre and the elevator must be acknowledged

World War II

McLachlan *et al* (1942) review the situation in the outbreak of the Second World War They begin Although seasickness is as old as history there is a remarkable conflict of ideas regarding its cause and the absence of an adequate remedy for it Much that has been written is in a speculative vein and hints are few and far between Despite the universal and disabling character of the malady little effort has been made to study it scientifically

A similar complaint is made by Tyler and Bard (1949) but they add The one firm development has been the securing of evidence that the vestibular apparatus is essential for the production of motion sickness And

subsidiary to this, there is the indication that in ships and boats linear rather than angular accelerations constitute the predominantly effective stimuli.' They go on to give a very complete account of the known facts about motion sickness with especial reference to and discussion of progress since 1939.

The problems of the Second World War, particularly of ocean transport, assault landings and aviation provoked a very intense study of motion sickness. These observations have increased our understanding of the aetiology and provided some advances in treatment.

Symptoms

The symptoms of motion sickness are too well known to require a detailed account here. The onset of nausea and vomiting can be quite sudden and the stimulus required to provoke them varies from subject to subject and even from day to day in the same subject. Yawning is a very common prodromal sign and often marks the onset of malaise which leads to nausea and vomiting. Salivation, irregular respiration, flatulence, pallor, cold sweating and a desire to defaecate may appear at this stage.

Occasionally fresh air or intellectual activity will avert vomiting but unless the motion becomes easier or adaptation takes place this is usually only temporary. Headache and dizziness may be felt, apathy, lassitude, and weakness are often present and their importance will be determined by the mental of the subject.

Abdominal pain is never a symptom of early motion sickness, and if it is present some other cause of the vomiting should be sought. After prolonged vomiting, bilateral subcostal ache arising from the diaphragm and upper abdominal muscles often appears.

In contrast to the severity of the symptoms the physical findings are negligible. Pallor often with a greenish tinge, sweating, yawning and over breathing are seen but not constantly. An anxious appearance confirms malaise but systemic examination reveals nothing further.

The Reality

It is as well at this stage to refer to the view commonly held sometimes amongst experienced sailors that seasickness is all nerves, in other words psychogenic. Those that hold this view are few but often vociferous and their experience is for the most part confined to large ships. The small ship sailor and especially those who have crossed the Atlantic in small boats recognize and guard against the hazard of seasickness.

Tyler and Bard (1949) mention the following points which have been brought to support the psychogenic theory: (a) finding of emotional instability and neurotic traits in very susceptible individuals, (b) claims that apprehension or fear cause or precipitate symptoms of motion sickness, (c) the precipitation by disagreeable sights or odours, (d) the fact that individuals may become sick on motionless vessels or airplanes and in a few cases even by looking at or thinking about a moving vehicle or a rough sea, (e) a supposed correlation between mental or physical activity and a diminution in suscepti-

[illegible] participated by [illegible] sickness who [illegible] effectively [illegible] call to [illegible] motion sickness agents [illegible] is a [illegible]

[illegible] reference to motion sickness conflicting reports and they conclude "In summary it can be stated that the results of relevant adequately controlled studies do not permit the conclusion that psychological or psychophysiological factors are of importance in the etiology of motion sickness."

While it must be admitted that psychological factors may aggravate or relieve motion sickness they are not the determining cause this as will be seen below lies in reactions to vestibular stimuli.

Susceptibility and Acclimatization

The variation in incidence of motion sickness in individuals and in the same individual have been studied extensively. The belief that motion sickness is confined to a relatively small and special fraction of the population has been dispelled. (Tyler and Bird 1949). Chinn (1951) suggests that everyone can be made sick by persevering with an appropriate stimulus and found that 90 per cent of inexperienced subjects were sick in severe conditions. Deaf mutes are never seasick owing to absent vestibular function but unfortunately the remaining small percentage of the population who are naturally immune are not likely prevented from theorizing about their immunity.

Mirchin *et al.* (1947) using a roll pitch rocker—the SS *Mal de mer*—found that a history of motion sickness was well reflected in the results they obtained. Severe symptoms were produced in thirty minutes in the following percentage

No. tested	History	No. sick	Per cent
26	Resistant	1	3.9
108	Unknown	34	31.8
41	Susceptible	28	68.3

Many observations suggest that infants and the elderly are less susceptible. The apparent immunity of infants may be due to the fact that they are normally in the horizontal position. Resistance to the effects of motion sickness increases with age. Experience seems to teach the sufferer to avoid or endure his trouble more easily.

In most people adaption to a specific type of motion taken a few hours in harbour may be sufficient to dispel it. A change of vessel or a different course with respect to the sea running will cause bout of sickness. Some adapt very quickly their adaptation lasts a week or more and serves for various types of motion. A very few have no capacity to adapt and are always sick while the motion continues. There are however no reports of death from uncomplicated seasickness.

Aetiology

The ultimate cause of motion sickness is motion and this was known to Hippocrates. Many theories have been advanced about the physiological

paths by which motion induces sickness. McEachern [illegible] (1948) [illegible] the following theories of aetiology.

Visual and kinesthetic factors. Although closing the eyes is said to prevent against sickness, attacks occur in the dark and in blind subjects.

Vascular factors. Carotid sinus stimulation and cerebral vascular changes have been invoked with little supporting evidence.

Movements of heavy viscera have been incriminated and the bird sailor would support this from his impression of having his stomach behind. There is little evidence either way here, partly because of the difficulty of investigating the hypothesis.

Chemical factors such as hypo- or hyperglycaemia and acidosis receive little support. Theories of vagotonia and sympathicotonia have been disregarded. Dietary indiscretions, especially those involving alcohol, may obviously be a contributory cause.

The labyrinth. Reference has already been made to the predominance of vestibular factors in the aetiology of motion sickness. The evidence for this is derived from:

(1) The similarity between the symptoms of Meniere's disease and of vestibular stimulation and motion sickness.

(2) The insusceptibility of deaf mutes who have absent vestibular function.

(3) The fact that motion sickness cannot be produced in previously susceptible animals after section of the vestibular nerve or destruction of the labyrinth.

McNally and Stuart (1942) review the physiology of the labyrinth in relation to motion sickness and they give a very full account of the development of knowledge about the vestibular apparatus. A simple account of the anatomy, mode of action and central connexions is given by Wright (1952).

The Vestibular Apparatus

In brief, the vestibular apparatus consists on each side of the three semicircular canals and the otolith organs (the utricle and saccule). The semicircular canals are filled with endolymph; at one end of each lies the crista which is sensitive to movement of the endolymph induced by rotatory acceleration or convection. The utricle and saccule contain otoliths (grains of calcareous material) embedded in a gelatinous substance interwoven by nerve fibres; this constitutes the macula. Movement of the otolith is the potent stimulus for the utricle and saccule.

The utricle is primarily a gravity organ sensitive to slow tipping about a horizontal axis but it is also sensitive to linear accelerations and centrifugal force. The macula of the utricle is roughly horizontal and that of the saccule vertical. By analogy it would seem that the saccule should be sensitive to the same forces as the utricle but in other planes. This is not certain; it is more probably connected with perception of vibration or with cochlear function.

Abnormal stimulation of the semicircular canals and utricle produces symptoms indistinguishable from motion sickness. Nystagmus is never seen in motion sickness although it always results from caloric and rotational

stimulation of the semicircular canals. For this reason and for others mentioned below it is assumed that the macula of the utricle originates the stimuli which result in motion sickness.

Tyler and Bard (1949) point out that a knowledge of the central connexions through which the vestibular stimuli exert their effect would be most useful when one considers (*a*) that the drugs which have proved useful in the prevention of motion sickness exert pronounced central effects and (*b*) that there is little if any reason to suppose that their peripheral actions contribute to their effectiveness.

Ablation experiments on the cortex of dogs indicate that their cortex plays no part in the production of motion sickness. Removal of those parts of the cerebellum connected with vestibular function abolishes susceptibility to motion sickness (Bard *et al.* 1937). Furthermore such dogs are still made to vomit by the action of apomorphine on the bulbar vomiting centre. This suggests that the cerebellum contains higher centres specifically necessary for the production of motion sickness. Borison and Wang (1953) give an extensive review of the physiology and pharmacology of vomiting and this work is discussed by them.

Encephalographic studies on those subject to motion sickness have not given any helpful information (Morton *et al.* 1947; Chinn *et al.* 1950).

Types of Motion Producing Sickness

Sjöberg (1929) analysed the characteristics of ship's movement into the angular components of roll and pitch and the vertical linear component of seeming (the bodily up and down movement of the ship as a whole). The angular components which he recorded were below the threshold for vestibular stimulation whereas the vertical linear component was well above. This finding offers a convincing explanation of the failure of the gyroballoid Bessemer cabin in which angular movements are eliminated but the potent vertical component necessarily remains.

Yawing, the movement of the ship bodily sideways, introduces another horizontal line of force. These may be important in the production of sea sickness but they were not separately studied by Sjöberg.

No work has been published on the effect of gyroscopic stabilizers in reducing seasickness. They act by reducing roll and pitch and therefore, eliminate chiefly angular components. Although the work outlined above suggests that linear movements are the most important there is the possibility that small angular components may potentiate them. It would be interesting to compare the incidence of sickness with and without stabilizers in the same ship over short periods of time.

Sudden changes in the type of motion, such as turning across a sea after heading into it, may induce a wave of nausea and vomiting in the crew. This is because adaptation has been to a particular pattern of vestibular stimulation. Similarly a sense of movement sometimes accompanied by malaise, nausea and even vomiting may persist ashore after a rough passage because time must elapse for readaptation to a stationary environment.

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Alexander *et al* [illegible] report an interesting and well controlled series of experiments [illegible] naval aviation is that something [illegible] sickness This [illegible] movements having [illegible] those with low [illegible] than swaying [illegible] only the design of [illegible] did not begin by [illegible] deductions are [illegible] are the factors involved

Hamilford *et al* (1952) attempted to study the problem at sea They recorded the motion in various compartments of an Atlantic troop transport using electronic accelerometers They were unlucky in having a smooth crossing and the overall sickness rate was only 3 per cent They were unable to correlate the peak sickness times with the recorded motion but noted that the highest incidence of sickness was at reveille This was due to the effect of head position discussed below

The Effect of Head Position

Although sufferers from seasickness are often only persuaded with difficulty to go below experience shows that the supine position usually allays symptoms Unfortunately this position is a peculiarly useless one unless the place of duty is designed with this restful end in view

The advantage of the supine position lies in its effect on the position of the head The utricular macula which is the foremost contender in the production of motion sickness is most sensitive to forces acting at right angles to its base and this lies in the plane of line joining the external auditory meatus and the lateral canthus of the eye This with head erect the macula is almost horizontal and vertical accelerations the principal effective ones in a ship have maximum effect In recumbency the macular becomes vertical and the effect is minimal In addition changes in the position of the head delay adaptation to motion This has been shown experimentally and in practice

The high incidence of sickness noted at reveille by Hamilford *et al* (1952) referred to above is explained by these findings The troops turn out and assume the erect posture thus instead of a steady force acting with minimal effect there is a varying force acting with maximal effect on the horizontal utricular macula One pair of Atlantic voyagers (Ellam and Mudie 1954) recommended slow changes of position on turning out as a means of avoiding sickness Although the recumbent posture is obligatory for the incapable seasick, it is best avoided if the sufferer has duties to perform Otherwise he

TIRRATA

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For *McMullin* read McMullen

Page 28 line 13 for *Bard et al* 1937 read *Bard et al* 1947

Page 28 line 31 for *Line of force* read linear force

Page 29 line 34 for *maicular* read macula

Page 34 line 39 for *Bard P et al* read Bard P (1947) *et al*

[illegible] of the [illegible] in canals. For this [illegible] that the macula of the utricle [illegible] which [illegible] motion sickness.

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There are three variables which may affect the character of the known motion acting on the labyrinth: the *magnitude* of the acceleration, the *duration* of time for which it acts, and the *frequency* with which it occurs.

Alexander *et al.* (1945) report an interesting and well controlled series of experiments using a vertical accelerator (a type of lift) with naval aviation cadets as subjects. They begin with the tentative hypothesis that something about the time character of waves is a primary condition of sickness. This hypothesis was suggested by the common experience that movements having large accelerations with brief phases are less nauseating than those with low acceleration and long phases. A rattle car is less nauseating than a swaying automobile and a choppy sea than a long swell. Unfortunately the design of the experiments was dominated by this hypothesis and they did not begin by assessing the three variables separately. Although their deductions are somewhat inconclusive, the original papers show how complex are the factors involved.

Handford *et al.* (1952) attempted to study the problem at sea. They recorded the motion in various components of an Atlantic troop transport using electronic accelerometers. They were unlucky in having a smooth crossing and the maximal sickness rate was only 3 per cent. They were unable to correlate the peak sickness times with the recorded motion but it appeared that the highest incidence of sickness was at reveille. This was due to the effect of head position discussed below.

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The advantage of the supine position lies in its effect on the position of the head. The utricular macula, which is the foremost concerned in the production of motion sickness, is most sensitive to forces acting at right angles to its base and this lies in the plane of line joining the external auditory meatus and the lateral canthus of the eye. Thus with head erect the macula is almost horizontal and vertical accelerations, the principal effective ones in a ship, have maximum effect. In recumbency the macula becomes vertical and the effect is minimal. In addition changes in the position of the head delay adaptation to motion. This has been shown experimentally and in practice.

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will only become active again with reluctance. In addition it is probable that adaptation takes place more slowly in remembrance.

Experimental

Motion sickness is a notoriously difficult subject to investigate. The number of independent variables is large and the subjective experiences of the sufferer and the observer influence the results. Experiments concerned with etiology are the most easily controlled for they are designed to throw light on a particular point such as for example the effect of head position. Some of these have been referred to above and they are very numerous.

Practical procedures to determine the susceptibility of subjects are disappointing. The results of the ordinary turning and caloric tests of vestibular function are poorly related to susceptibility. Swing tests give a rough measure but Hulling (1947) reviewing wartime investigations says that to eliminate potential sufferers thus would be too wasteful to me. Some would be eliminated who would be capable of adaptation and many accepted who would fail to the different motions of a ship or aeroplane.

There are numerous drugs with a reputation against motion sickness and they continue to appear. A convenient method of screening them in the laboratory would be most useful. It is possible that a test of vestibular function will be evolved for this purpose but the value of those at present available remains in doubt.

The final answer to the problem is the field trial and many of these have been carried out under controlled conditions. There are basically two variable factors in such a trial the different types of motion experienced and the varying susceptibility of the subjects. The latter factor can be controlled by using large numbers of unselected subjects and establishing an adequate control group. Care must be taken that the control and test groups are distributed together through the ship or they will experience different types of motion. Sickness may be precipitated by the sight of sickness in another. If an effective drug reduces the incidence of sickness in a compartment fewer cases will be thus precipitated and its effectiveness in relation to the control group will be magnified.

Many of the symptoms of motion sickness are subjective and the sickness rate should be established by trained observers rather than by a simple statement of the subject. Actual vomiting is the best criterion or nausea as compared by other objective evidence of malaise such as pallor sweating yawning or sighing. The observer should not know which drug the subjects have had or this knowledge may influence his observations.

The period trial should be short or adaption will set in and vitiate the results. The motion should be violent sufficient to produce a high rate of sickness in the control group. This is because the effectiveness of many remedies falls off with the severity of the motion as measured by the sickness rate in the control group. Hulling *et al.* (1944) used the formula

$$\frac{(\%\ \text{sick in control group}) - (\%\ \text{sick in treated group})}{(\%\ \text{sick in control group})} \times 100$$

in calculating the prophylactic protection afforded by a drug. The [illegible] that this would be invalidated in comparing drugs if the effective [illegible] drug varied with the roughness of the sea, and this it does. Sickness [illegible] over 50 per cent in the control group give more reliable results but the best way to compare one drug with another is to try them simultaneously and repeatedly.

The perversity of the elements is a factor to be reckoned with. Holling *et al* (1944) comment bitterly: "Chronic sufferers from seasickness may be astonished to learn that on most days throughout the year a persistent and baffling calm haunts the waters round this island." In order to overcome this experiments have been made in a swimming bath using artificial waves and measuring the motion with accelerometers. Glaser and Harvey (1972) did this and while they were able to reproduce constant conditions the regularity of the motion soon produced adaptation. The men sat in covered rubber floats and the adaptation was partially to the proximity of vomiting in such unusual surroundings. Many complained of the smell of rubber which emphasizes the artificiality of the trial.

Swings, lifts and other forms of apparatus have been used to test drugs. The motion is completely controlled and its character can be analysed and tests are carried out separately so that subjects do not influence one another. Chinn and Plotnikoff (1953) describe experiments in which dogs and humans were swung to test the effect of hyoscine, benadryl and leergan. However a lack of correlation between the findings and the known effectiveness of the drugs in motion sickness was pointed out. Such methods, which require their results to be confirmed by a full and adequately controlled field trial, form a cumbersome means of assessing the value of drugs in motion sickness. They are, however, the best available at present.

No tests appear to have been made using subjects of known susceptibility. It would seem that a medical officer in the course of a seagoing commission would have the opportunity to determine the susceptibility of say fifty of the ship's company and to place them in pairs or groups. The status of different drugs with respect to those groups could then be assessed. The value of such studies would be increased if a simple accelerometer could be devised to record the actual motion experienced. In the absence of this a group of untreated men of known susceptibility would form a useful estimate of the emetic capacity of the prevailing sea. Several objections are at once apparent. Individuals vary from day to day in their susceptibility to motion and those susceptible to one type of motion are not always affected by another. Assuming that it were possible to find comparable groups, some drugs might be more effective with one group than another, but this in itself would be an interesting finding.

The arrival of the stabilizer suggests another approach. Artificial rolling might induce seasickness in the more susceptible members. A short period of rolling in sheltered water would establish a standard for the day for comparison with a subsequent trial in severe conditions at sea. Further rolling on return would give an estimate of the amount of adaptation that had occurred.

Individual studies rather than mass statistical tests might in this way

give information on unconfirmed or unsuspected aspects of motion sickness In addition such tests might enable individuals to select from the many available remedies one best suited to their needs

Treatment

The methods of treatment of motion sickness are innumerable and the literature of this branch of the subject is larger than any other Only the briefest outline can be given here

In general the methods depend for their origin on the view of the etiology of motion sickness held by their originator A few such as A soup made of horse radish and rice seasoned with red herrings and sardines (Anonymous 1862) are purely esoteric Other dietary measures are controversial Probably a light nourishing meal of good plain food before embarking is a sensible precaution Some of the more greasy or oriate dishes available to the traveller might well precipitate vomiting without any additional stimulus Alcoholic excesses are best avoided and Tyler and Bard (1949) remark quizzically while the consumption of considerable quantities of champagne is known to result in some temporary indifference to the symptoms of seasickness experienced sailors report that disastrous results are liable to attend the practice of going to sea with a hangover

Mechanical measures such as tight abdominal binders and pneumatic cuffs are based on unsound principles of etiology and have had no proved success Breathing exercises controlled breathing during the voyage and physical training have been found useless Attempts to produce adaptation before embarkation by swinging or other orbital measures have not resulted in any immunity This is probably because the adaptation is to a specific type of vestibular stimulation

The logical remedy for motion sickness is a drug which will either raise the threshold of the vestibular apparatus or reduce the sensitivity of the centres concerned in the reception of vestibular stimuli and the initiation of sickness The most troublesome feature of motion sickness is not the act of vomiting but the period of nausea and malaise preceding and only too soon following the actual vomit Hence a drug which acts peripherally is of little value

The belladonna group of drugs were probably first adopted because of their relaxing effect on smooth muscle the object being to quieten the stomach musculature This was a fundamental misconception In vomiting all peristaltic activity stops in the stomach and emesis is effected by the contraction of the abdominal and perineal muscles and the diaphragm which together raise the intra-abdominal pressure and force the contents of the lax stomach up the oesophagus Thus the most forcible vomit comes from the relaxed and dilated stomach of pyloric stenosis The same mechanism prevails in motion sickness and this has been demonstrated by barium X ray screening of subjects nauseated in a swing (Holling 1947)

Hyoscine the most effective of the belladonna group almost certainly acts centrally It is possible that the centres on which it acts are in the cerebellum or near the bulbar vomiting centre The mode of action is un

known [illegible] may be by [illegible] cortical connectors between the vestibular apparatus and the centre [illegible] the centre and another or in the efferents. Field trials have indicated that hyoscine is an effective remedy (Holling *et al.* 1944; Glaser and Harvey [illegible]) and that some has been used against seasickness for many years.

The discovery of the effect of the antihistamines against motion sickness was even more fortuitous. Dramamine (dimenhydrinate) which is Benadryl (diphenhydramine) conjugated with 8 chlorotheophyllinate in an attempt to overcome the drowsiness caused by Benadryl alone was given to a pregnant woman with urticaria. All her life she had suffered from car sickness but whilst taking Dramamine she was completely immune (Guy and Carlisle 1949). A sea trial was soon carried out and although the design of the experiment did not follow the principles mentioned above some evidence was produced that Dramamine is effective in the treatment of motion sickness.

Since then other antihistamines have been tried with varying success. Avomine is a combination of Phenergan (promezathine hydrochloride) with 8 chlorotheophylline. There is some doubt whether the chlorotheophylline plays any part (Glaser and Harvey 1951; Gay 1952) and while Avomine is effective it is suggested that Phenergan alone in the same dose would be more effective. The effectiveness of the antihistamines is not directly related to their antihistamine activity. Many strong antihistamines for example Anthisan (mepyramine maleate) and Thephorin (phenindiamine tartrate) have no effect against motion sickness (Chum *et al.* 1950). The evidence concerning the relative effectiveness and mode of action of hyoscine and the antihistamines is reviewed by the *Lancet* (Anonymous 1953). Promezathine seems the best at present because of its long action and its freedom from side effects. Its effectiveness relative to hyoscine varies with the circumstances and subjects in which it is used and also presumably from subject to subject.

Recently a new antihistamine has been introduced. Marzine (cyclizine hydrochloride). Chum *et al.* (1952) found it effective in a sea trial in which it was known as Preparation 47 83. Gutman *et al.* (1954) report its effect in depressing vestibular function and it has been used with good result in the treatment of vertigo (Witzemann 1954). A trial reported by Chum *et al.* (1953) had an extremely low (under 10 per cent.) incidence of vomiting in the placebo group and is therefore of little value. Further trials are necessary to establish its place among motion sickness remedies.

Benzedrine (amphetamine sulphate) had a short vogue (Hill 1937; Keeval 1938) but is now only mentioned for its effect in preventing somnolence induced by other drugs (Hill and Guest 1945). Pyridoxine is effective against radiation sickness and it is claimed that it has a similar effect against motion sickness (Benkendorf 1953; Voss 1953).

The value of any motion sickness remedy may be reduced by a high incidence of side effects. Some of these such as headache drowsiness and dizziness may be difficult to distinguish from the effects of motion. Many trials of drugs report the incidence of side effects it is not great in substances mentioned above. Drowsiness may occur with hyoscine and antihistamines and can be

[illegible] and blurred vision [illegible] [illegible] (1943) has made an experiment [illegible] the side effects of hyoscine Phenergan and Benadryl

Many remedies [illegible] and trade may prove one more suitable than another for an individual The oral remedy hyoscine hydrobromide is cheap and often effective It is most important that the initial dose of 1/100 gram be given at least an hour before the motion begins Although Glasser and Hervey (1942) report that hyoscine taken a few minutes before the onset of motion was partially effective tablets taken when malaise begins usually provoke vomiting The findings concerning the effect of head position suggest the advisability of taking the morning dose half an hour before turning out in heavy weather Adaptation usually takes place in two days and the administration which should be 1/200 gram six hourly can be discontinued There is no evidence that taking hyoscine prevents or delays adaptation Recurrence of heavy weather after a calm or a different type of motion would suggest the resumption of medication

Summary

Motion sickness is defined and its importance particularly in naval medicine is stressed Reference is made to the lack of exact knowledge at the outbreak of the Second World War and to the great advances which it provoked A brief account of the symptoms is followed by a discussion of psychological factors and of individual variation in susceptibility and adaptation

The aetiology of motion sickness is discussed at length and it is stated that the condition is the result of a reaction to specific patterns of vestibular stimulation The types of motion producing sickness and the importance of head position are discussed Experimental methods are reviewed particularly vestibular tests and field trials of anti motion sickness drugs The article concludes with a short account of the available modes of treatment

Envoi

It is peculiarly appropriate that the prime cause of motion sickness should have been traced to the labyrinth There lies the Minotaur exacting his annual sacrifice from the sailor The golden clue which will lead us through the maze of evidence to conquer him has yet to be found

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CLASSIFIED MEDICAL REFERENCES IN THE WORKS OF SHAKESPEARE

BY

Surgeon Commander J. W. L. CROSFILL, R.N.

PART VIII

Mail: Beneficial Effects of

985 *Menenius* A letter for me? it gives me an estate of seven years health in which time I will make a lip at the physician: the most sovereign prescription in Galen is but empiricutic, and to this preservative of no better report than a horse drench. [illegible] *Coriolanus* [illegible]

(See also the time spent are the usual [illegible] in this quotation. As efficient a mail service as our forefathers [illegible] with the realization that in its absence the liability to psychiatric disorders is greatly increased. To the members of the Dutfong and Naval Air Service [illegible] their homes at peace time environment [illegible] unusual mental strain, the receipt of a letter only as a mental [illegible] pharmacy contains. The morale rises, the anxiety with its accompanying lack of sleep, loss of power of concentration, loss of efficiency, which [illegible] may [illegible] prepossessed to [illegible] is most noticeably affected by the arrival of mail.)

MAKE-UP

986 *K[illegible]* [illegible] cheek, beautied with plastering art,
[illegible] ugly to the thing that helps it
[illegible] deed to my most painted word. —*Hamlet* [illegible]

987 *Ha[illegible]* [illegible] of your paintings too, well enough;
[illegible] you one face, and you make yourselves
[illegible] —*Hamlet* [illegible]

988 *H[illegible]* [illegible] lady's chamber, and tell her
[illegible] paint an inch thick, to this favour she must come
[illegible] Yorick's Skull) —*Hamlet* [illegible]

989 *P[illegible]* [illegible]
[illegible]

990 *B[illegible]* [illegible] hair shall be of what colour it please God. —*Much Ado About Nothing* [illegible]

991 [illegible]
[illegible]
[illegible]

3rd [illegible] black [illegible] patches [illegible]
[illegible] talk [illegible] back [illegible]
4th [illegible] the [illegible] black patch [illegible]
22nd [illegible] my [illegible] her [illegible] much [illegible]
[illegible] April 1667 [illegible] her [illegible] with [illegible] pimples [illegible] a black patch [illegible]

Latches [illegible] not con[illegible] otherwise [illegible] On the 8th August [illegible] upon [illegible] the [illegible]

MALINGERING

992 *Clown* [illegible] mad [illegible]
[illegible] —*Twelfth Night* iv. 2

993 *Horatio* [illegible] their repair hither and say [illegible] —*Hamlet* v. 2

994 *Goneril* I will not speak with him; say I am sick. —*King Lear* i. 3

995 *Gloster* [illegible] I am ill and gone to bed. —*King Lear* iii. 3

996 *Servilius* [illegible] health and keeps his chamber.
Servant Many do keep their chambers are not sick. —*Timon of Athens* iii. 4

997 *Imogen* [illegible] feign a sickness. —*Cymbeline* iii. 2

998 *Bel[illegible]* Yet [illegible] noses with spi[illegible]
bleed [illegible] bestial her our gum[illegible]
swe[illegible] men [illegible]

999 *Pist[illegible]* And [illegible] unto these [illegible]
And [illegible] the Cath[illegible] [illegible] 9

(Pistol has just hurt [illegible] d all from syphi[illegible] nch Disease. The scars he [illegible] cary [illegible] French D[illegible] phils *See* Make up for th[illegible]

1000 *Clown* O [illegible] whether the [illegible] kin[illegible]

Comedy [illegible] h[illegible] ur
s[illegible] kes is that [illegible]

1001 *Phebe* [illegible]

1002 *Oliver* [illegible] n
[illegible]

Celia [illegible]
hon[illegible]

Measles

One of the earliest works on measles was that of the Arabian physician Rhazes 860 932 who discussed the differential diagnosis of measles and smallpox Rhazes is said to have suffered from post traumatic optic atrophy as a result of being struck on his head as a punishment by one of his own volumes a weight of 22 lbs Guthrie s History of Medicine

1003 *Coriolanus* As for my country I have shed my blood
Not fearing outward force so shall my lungs
Coin words till their decay against those measles
Which we disdain should tetter us yet sought
The very way to catch them *Coriolanus* iii 1

Medicine (*See also* Physic Remedies)

1004 *Malcolm* Let s make us medicines of our great revenge
To cure this deadly grief *Macbeth* iv 3

1005 *Cathness* Well may it sicken man
To give obedience where tis truly owed
Meet we the medicine of the sickly weal
And with him pour we in our country s purge
Each drop of us *Macbeth* v 1

(A medical simile for Malcolm the lawful Prince The success of the owner of the rightful title to the throne would cure the woes of the commonwealth (a civil war)

1006 *Othello* Drop tears as fast as the Arabian trees
Their medicinal gum —*Othello* i 3

1007 *Laertes* Hamlet thou art slain
No medicine in the world can do thee good
In thee there is not half an hour of life
The treacherous instrument is in thy hand
Unbated and envenomed —*Hamlet* v 2

[illegible]

1008 *G* [illegible]

1009 *T* [illegible]

1010 *h* [illegible]

1011 *Cal* [illegible]

1012 *Mon* [illegible]

1013 *Kne* [illegible]

1014 *I* [illegible]

[illegible]

1017 [illegible]

1018 [illegible]

1019 [illegible]

1020 [illegible]

Medicine [illegible]

1021 [illegible]

[illegible] —*Lancet*, [illegible]

Medico Legal

[illegible] *Pericles* The child was prisoner to the womb and is
By law and process of great Nature thence
Free'd and enfranchised, not a party to
The anger of the King, nor guilty of
If any be the trespass of the Queen. [illegible] *Pericles* [illegible]

[illegible] *Pericles* Then Juno, displeased that thou shedst
That warm blood by which I live in the goodness
Lost with child, yet bloody, bitterness
Mortal mortal, then the fruit within thy womb
Although [illegible] *Pericles* [illegible]

Memory

[illegible] *Macbeth* [illegible]
With thousands [illegible] know [illegible]
[illegible] *Macbeth*

[illegible] *Hamlet* [illegible]
In the leaves of my memory
[illegible] the table of my memory
[illegible]
[illegible]
[illegible]
[illegible] with baser matter. *Hamlet* i. 5.

Both [illegible] to the tablets of the memory. It was a custom [illegible] clinical references in the plays to carry tablet books or [illegible] memorandum books. Contemporary illustrations show [illegible] from the girdles.

Memory, Loss of

[illegible] *Hamlet* [illegible] does he this—he does—what was I about
[illegible] the Mass, I was about to say something
[illegible] *Hamlet* ii. 2.

[illegible] *Lear* [illegible] happy that see, I well remember
[illegible] yearning time: but whether there
[illegible] by the holy gods
I cannot rightly say. *Pericles* iii. 4.

In these two quotations Shakespeare preserves the Clinical unity. He rightly puts the forgetting and lack of concentration into the mouth of Polonius, an elderly man.

Thaisa's memory blank is quite consistent with her history of a cataleptic state at childbirth with the attendant mental stress due to the storm at sea and her "burial." Her case would no doubt today be labelled as Hysteria.

MENTAL 91

[illegible] [illegible] the sc like [illegible]
[illegible] [illegible] [illegible] hand up with
Richard III [illegible]

MENTAL DISTU[illegible] *when* BRAIN MANIA HYSTERIA [illegible]
WALKING LUNACY (*cc*)

1029 *Lady* To think
Macbeth [illegible] *Macbeth* [illegible]

1030 *Lady* [illegible] the night
Macbeth [illegible] *Macbeth* [illegible]

1031 *Lear* [illegible]
[illegible] *Macbeth* [illegible]

1032 *Lady* [illegible]
Macbeth [illegible] *Macbeth* [illegible]

1033 *Othello* [illegible] the M[illegible]
[illegible] the [illegible] that [illegible]
[illegible]

(Th[illegible] [illegible] M[illegible] [illegible]
l gual sup[illegible] [illegible] of [illegible]
paper [illegible] the [illegible])

1034 *Hamlet* [illegible]

(Th[illegible] [illegible] brain [illegible]
Dem[illegible] [illegible]
Mem[illegible] *H*[illegible]
Also in *H*[illegible]
Hamlet [illegible])

1035 *Hamlet* [illegible]

1036 *Brutus* [illegible]
[illegible]
[illegible]
[illegible] *Julius Caesar* [illegible]

1037 *Iago* [illegible]
[illegible] *Othello* [illegible]

1038 *Brutus* [illegible] *Julius Caesar* [illegible]

1039 *Ophelia* [illegible]
[illegible]
[illegible]
[illegible] *Hamlet* [illegible]

1040 *Lear* [illegible]
[illegible]
[illegible]
[illegible]
[illegible] *Hamlet* [illegible]

1041 *Polonius* [illegible]
[illegible]
[illegible] *Hamlet* [illegible]

1042 *King* Madness [illegible] *Hamlet* [illegible]

1043 *Queen* This is the [illegible]
This [illegible]
[illegible] *Hamlet* [illegible]

1044 *Ophelia* My lord, as I was sewing in my chamber
Lord Hamlet, with his doublet all unbraced
No hat upon his head, his stockings fouled
Ungartered and down gyved to his ankle
Pale as his shirt, his knees knocking each other
And with a look so piteous in purport
As if he had been loosed out of Hell
To speak of horrors, he comes before me.—*Hamlet* II 1

1045 *Polonius* This is the very ecstasy of love,
Whose violent property fordoes itself
And leads the will to desperate undertakings
As oft as any passion under heaven
That does afflict our natures. I am sorry
What have you given him any hard words of late?
Hamlet II 1

1046 *King* Something you have heard
Of Hamlet's transformation, so I call it
Since nor the exterior nor the inward man
Resembles that it was.
I entreat you both
That being of so young days brought up with him
And since so neighbored to his youth and humour
That you vouchsafe your rest here in our Court
Some little time, so by your companies
To draw him on to pleasures, and to gather
So much as from occasion you may glean
Whether aught to us unknown afflicts him thus
That opened lies within our remedy.—*Hamlet* II 2

1047 *Polonius* Mad call I it; for to define true madness
What is it but to be nothing else but mad?

Mad let us grant him then, and now remains
That we find out the cause of this effect
Or rather say the cause of this defect.—*Hamlet* II 2

1048 *Queen* Mad as the sea and wind when both contend
Which is the mightier. In his lawless fit
Behind the arras hearing something stir
He pulls his rapier out, and cries, A rat, A rat,
And in his brainish apprehension kills
The unseen good old man.—*Hamlet* III 5

1049 *Lear* When nature being oppressed, commands the mind
To suffer with the body.—*King Lear* II 4

1050 *Lear* I fear I am not in my perfect mind.—*King Lear* IV 7

1051 *Constance* I am sick and capable of fears
Oppressed with wrongs, and therefore full of fears.—
King John III 1

1052 *Constance* I am not mad. I would to Heaven I were!
For then 'tis like I should forget myself
O, if I could what grief should I forget!

But being not mad, but sensible of grief
My reasonable part produces reason

Him I will hold responsible for all these evils
And teaches me how to kill or hang myself
If I were mad I should forget my son
Or madly think a babe of clouts were he
I am not mad too well I feel
The different plague of each calamity —*King Lear* III 4

1054 *Hermione* The Lady Cleostrata when she heavy died —*Winter's Tale* III

1055 *Lord* And so with great injunction
Randolph Proper to madness let his powers in death
And winking at your destruction —*Henry VIII* III

1055 *Lear* Was he crossed so?
Steward O very mad exceeding mad in love too
But he was good into none —*Henry VIII* V 1

1056 *Cassius* And learning hath would rise he was so virtuous
Kept back a foreign man still which so grieved him
That he ran mad and dies —*Henry VIII* II 2

(Holinshed says that Wolsey kept Dr Lace abroad on frivolous pretexts because jealous of him that at length he took such a fit therewith that he lost out of his right wits)

1057 *Norfolk* some strange commotion
In his brain he bites his lip and starts
Stops on a sudden looks upon the ground
Then lays his finger on his temple straight
Springs out into fast gait then stops again
Strikes his breast hard and then anon he casts
His eye against the Moon in most strange postures
We have seen him set himself —*Henry VIII* III 2

1058 *Pericles* The passions of the mind
That have their first conception by misdread
Have after nourishment and life by care
And what was first but fear what might be done
Grows elder now —*Pericles* I 2

1059 *Duke* I think you are all crazed or stark mad —*Comedy of Errors* V 1
(mated bewildered)

1060 *Rosalind* I love to cherish a craziness and I tell you deserves as well a dark house and a whip as madness do and the reason why they are not so punished and cured is that the lunacy is so ordinary that the whippers are in love too Yet I profess curing it by counsel —*As You Like It* III 2

(Shakespeare is here quite in the Middle Ages and Elizabethan attitude toward the mentally sick and of harshness as a punishment Besides he is treating the subject whimsically Elsewhere when mental disturbance is an integral part of the plot Shakespeare's own attitude if one may so judge from the tragedies was much more humane and in advance of the popular ideas of the time It is apparent that he had a very clear insight into the causes of mental imbalance and very good ideas as to the proper principles of treatment It is impossible to imagine him punishing the insane by incarceration in the dark and by whipping or even relying on polypharmacy)

1061 My love is as a fever longing still
For that which longer nurseth the disease
Feeding on that which doth preserve the ill
The uncertain sickly appetite to please
My reason the physician to my love
Angry that his prescriptions are not kept

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Ang. I [illegible]

Thess. He [illegible]

Adriana Thus [illegible]
And [illegible]
But [illegible]
Ne[illegible]

Abbess Hath [illegible]
Bure[illegible]
Stri[illegible]
A su[illegible]
Wh[illegible]
Which [illegible]

Adriana. To none of these, except it be the last,
Namely, some love that drew him oft from home.

Abbess. You should for that have reprehended him.

Adriana. It was the copy of our conference.
In bed he slept not for my urging it;
At board he fed not for my urging it;
Alone it was the subject of my theme;
In company I often glanced at it;
Still did I tell him it was vile and bad.

Abbess. And thereof came it that the man was mad.
The venom clamours of a jealous woman
Poison more deadly than a mad dog's tooth.
It seems his sleeps were hindered by thy railing;
And thereof comes it that his head is light.
Thou sayest his meat was sauced with thy upbraidings;
Unquiet meals make ill digestions —
Thereof the raging fire of fever bred;
And what a fever but a fit of madness?
Thou sayest his sport were hindered by thy brawls.
Sweet recreation barred, what doth ensue
But moody and dull melancholy,
Kinsman to grim and comfortless despair;
And at his heels a huge infectious troop
Of pale distemperatures and foes to life?
In food, in sport, and life-preserving rest
To be disturbed would mad or man or beast.
The consequence is then, thy jealous fits
Have scared thy husband to the use of wits.

Luciana. I will attend my husband, be his nurse,
Diet his sickness, for it is my office,
And will have no attorney but myself;
And therefore let me have him alone with me.

Abbess. Be patient; for I will not let him stir
Till I have used the approved means I have,
With wholesome syrups, drugs and holy prayers
To make of him a formal man again.
It is a branch and parcel of mine oath,
A charitable duty of my order.
Therefore depart and leave him here with me.

Two Noble Kinsmen iv 3

1671 *Doctor.* Her distraction is more at some time of the Moon than at other some, is it not?

Jailer. She is continually in a harmless distemper; sleeps little altogether without appetite, save often drinking, dreaming of another world and a better; and what broken pieces of matter soever she speaks about, the name of Palamon lards it, that she forces every business withal, fits it to every question. I look where she comes; you shall perceive her behaviour.

Emilia. I have forgot it quite; the burden on't was Down-a-down, and penned by no worse man than Geraldo, Emilia's schoolmaster; he's as fantastical too, as ever he may go upon's legs; for in the next world will Dido see Palamon, and then will she be out of love with Aeneas.

Doctor What stuff's here! poor soul!

Jailer Even thus all day long

Doctor How her brain cons! How she [illegible] out! Tis not an engrafted madness but most [illegible] and melancholy. I think she has a peri[illegible] which I cannot minister to.

Jailer Alas, what then?

Doctor Understand you she ever affected [illegible] Palamon?

Jailer I was once, sir, in great hope she had [illegible] gentleman my friend.

Wooer I did think so too.

Doctor That intemperate surfeit of her eye hath [illegible] other senses, they may return and settle [illegible] their preordained faculties, but their [illegible] extravagant vigary. Did you ever [illegible] place where the lighter may rather see [illegible] permitted. Take up an ear, you, [illegible] of Palamon, say you come [illegible] of love: this will catch her attention, for his her mind beats upon other objects that are inserted 'twixt her mind and eye become the pranks and tricks of her madness; sing to her such green songs of love as she says Palamon hath sung in prison; come to her stuck in as sweet flowers as the season is mistress of, and there to make an addition of some other compounded odours which are grateful in the sense: all this shall become Palamon, for Palamon can sing, and Palamon is sweet, and every good thing: desire to eat with her, carve her, drink to her, and still among intermingle your petition of grace and acceptance into her favour: learn what maids have been her companions and play-fers, and let them repair to her with Palamon in their mouths, and appear with tokens, as if they suggested for him. It is a falsehood she is in, which is with falsehoods to be combated. This may bring her to eat, to sleep, and reduce what's now out of square in her into their former law and regiment. I have seen it approved how many times. I know not but to make the number more, I have great hope in this.

Act V. Scene 2.

Doctor Has this advice I told you done any good upon her?

Wooer O very much: the maids that kept her company
have half persuaded her that I am Palamon.
Within this half hour she came smiling to me,
And asked me what I did, and when I did kiss her
I told her presently, and kissed her twice.

Doctor Twas well done: twenty times had been far better.
For there the cure lies mainly.

Wooer Then she told me
She'd watch with me to-night, for well she knew
What hour my fit would take me.

Doctor Let her do so.
And when your fit comes, fit her home, and presently

Wom. She would [illegible]
Doct. [illegible]
Wom. [illegible]
Doct. [illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
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[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
Wom. [illegible]
Doct. [illegible]
Wom. [illegible]
Doct. [illegible]
[illegible]
[illegible]
[illegible] of flesh—[illegible]
[illegible] [illegible]
Doct. [illegible] her [illegible]
[illegible]
[illegible]
[illegible] doctor
[illegible]

Act V Scene [illegible]

[illegible] restored
[illegible]
[illegible] [illegible]
[illegible]
[illegible] fancies,
[illegible] rest.

[illegible] Case—Incidence of that

[illegible]

[illegible]

[illegible]

1084 *Lear* I am not mad, too well I feel
The different plague of each calamity —*King Lear* iii 4

MILK

1085 *Maria* One would think his mother's milk were scarce out of him
Twelfth Night i 5
(Juliet was weaned at something under three years of age Wormwood applied to the nipples to dissuade her from breast feeding)

MIDWIFE

1086 *Aaron* But say again, how many saw the child
Nurse Cornelia the midwife and myself
And no one else but the deliver'd Empress
Titus Andronicus iv 2

1087 *Sir Toby* I have gone about thee with a midwife *Twelfth Night* ii 5

1088 *Queen* Sir Green thou art the midwife to my woe —*Richard II* ii 2

The practice of Midwifery must of necessity be as old as man himself The problems of child birth might well be expected to take a prominent place in the history of medicine Such was the case up to classical times when the Hippocratic school described the various positions of the foetus *in utero* and detailed the procedures necessary for correction of malpositioning As implied in the very name Caesarean section was practised in Roman times a law being passed authorizing the extraction of the child of a mother dying in pregnancy After the classical period there was no real progress in midwifery until the sixteenth century Obstetrics took a path divorced as was surgery, from medicine being practised by midwives in the main an ignorant self taught class It was not considered consistent with either dignity or contemporary morality for surgeons or physicians the latter including the monastic practitioners to occupy themselves with child birth The revival of academic interest in midwifery is marked by the appearance in England of "The Byrth of Mankynde" by Raynold in 1540 based on the translation of a German publication of 1513 This work printed in English so that the uneducated midwife could appreciate it discusses prenatal care retained placenta the various presentations twins monsters and embryotomy "Midwives among the which as there be many right expert diligent wise circumspect and tender about such busnesse as appertainoth to their office so be there againe many no full indiscreete unreasonable churlish and farre to seek in such things the which should chiefly helpe and succour the women in their most painfull labour (througs) through whose rudenesse and rashenesse onely I doubt not but that a great number of women in their labour speede worse then needed otherwise

Raynold goes on to state that the bad midwives wished to have his publication forbidden but that the good ones welcomed it Rueff's version published in 1554 has an illustration showing the birth scene in which the patient is sitting on a birth stool The attendant midwife is manipulating under the cover of the patient's clothing A tub is placed beside her whilst the table has on it a ball of wool or twine and a pair of shears and what is

apparently a flask presumably for the recommended eye irrigation In the background are two men casting the horoscope of the child

At the same period Pare was practising and writing on pediatric version John Banister in 1578 however was persuaded that by lifting up the veil of Nature s secrets in women s shapes I shall commit more indecencie against the office of decorum than yield needful instruction to the profit of the common sort

Andrew Borde in 'The Breviary of Health 1552 suggested that mid wives should be controlled that they should be examined by a bishop with the help of a physician and given instruction 'for and this were used in England there should not half so many women miscarry nor so many children perished in every place in England as there be

MISCARRIAGE

1089 *Doll* an the child I go with do miscarry thou wert better thou
Tearsheet hadst struck thy mother thou paper faced villain
Hostess But I pray God the fruit of her womb miscarry —

Henry II 1 t 2 v 4

MOB PSYCHOLOGY

1090 *Prince* I nor did I but suspect a fearful man
He should have leave to go away betimes
Lest in our need he might infect another
And make him of like spirit to himself —*Henry VI* Pt 3 v 1

MONOMANIA

1091 *Lear* the tempest in my mind
Doth from my senses take all feeling else
Save what beats there.—*King Lear* III 4

MUMMY

1092 *Othello* That handkerchief
Did an Egyptian to my mother give
She was a charmer and could almost read
The thoughts of people
The worms were hallow d that did breed the silk
And it was dried in mummy which the skilful
Conserved of maiden s hearts —*Othello* III 4

Mummy had a considerable vogue in Elizabethan medicine One of its supposed virtues was that of ameliorating epilepsy It is listed as one of the desirable contents of a surgeon's chest by Woodall (1639) An interesting comment on the social and professional position of a ship s surgeon of that period is given by the following extract from his book If the Surgeon's Mate cannot trimme men then by due consequence there is to be a Barber to the Ships Company and he ought not to be wanting of these following necessaries The necessaries include 'Eare picker one and curling instruments together with the more orthodox surgical instruments

Mummy has been disparaged by Ambroise Paré and Sir [illegible] Browne [illegible] Burton in the 1624 verses

> The Egyptian mummy which Cambyses or time hath spared [illegible]
> now consumeth Mummy is become merchandise Mizraim cures
> wounds and Pharaoh is sold for balsams

Mummy is one of the ingredients in the witches broth in Macbeth Apparently enough mummy of witch was specified on that occasion A 1681 price list quotes Mummy at 7s 4d per pound

Music

[illegible]	*Tempest*	That old and antique song we heard last night Methought it lapped my sense as honey will Much more than a knell when it rings Of these in the [illegible] and giddy paced times — *Twelfth Night* [illegible]
[illegible]	*Richard*	This music mads me let it sound no more For methinks it hath a kind of madness in it In man as sounds not well make wise men mad *Richard II* [illegible]
[illegible]	*Hamlet*	[illegible] music and gentle [illegible] Unless some dull and [illegible] hand Doth whisper [illegible] *Hamlet* [illegible]
[illegible]		[illegible] of apoplexy
[illegible]	*Tempest*	[illegible] as the best comforter [illegible] unsettled fancy cure the brains [illegible] than the skull *Tempest* [illegible]
[illegible]		[illegible] music which charmeth sharp [illegible] *Winter's Tale* [illegible]
[illegible]		[illegible] hand and full of rage [illegible] hath [illegible] — *Measure for Measure* [illegible]

He had in the power of music over the spirits of his people back to their duty [illegible] when the evil spirit from God was upon Saul [illegible] David took an harp and played with his hands so Saul was refreshed and was well and the evil spirit departed from him (1 Samuel XVI verse 23)

Homer mentions music by the Greek army against the plague Theophrastus for the cure of lumbago and sciatica distribution and Varro for the gout

Celsius quotes in his commentation of Theophrastus that music is a specific for the bite of a spider

Pliny doubted that music could affect real bodily injury The interest in the possible effects of music on body function has persisted The philosophical Magazine for May 1806 has several of the medical literati on the continent are at present engaged in making inquiries and experiments upon the influence of music in the cure of diseases

The epidemic Dancing Mania active in Germany from the tenth to the fourteenth century did not die out in Italy until much later Tarantism as the Italian variety of Dancing Mania was called was at its height in the XVIIth century Music was the prescribed cure for these dancing possessed

The Italian belief is that the condition was caused by the bite of a spider. The special music for this cure became a musical form of its own, the lively dance form, the Tarentella. The connexion between music and the mad Tarantula is apparent.

> February 4th 1661. At Westminster Hall [illegible] the morning, and at noon [illegible] Lord Crew [illegible] ingenious man and a person of [illegible] of the nature of serpents [illegible] growth a great bigness [illegible] be just [illegible] apprehend that [illegible] for the bird [illegible] [illegible] (about [illegible] [illegible]

Our own period has seen the introduction of music into [illegible] the fundamental idea being that it helps to stimulate peristaltic [illegible]

MUTILATION

1699 *Fool* [illegible] that [illegible]
[illegible] —*[illegible]*

Cases of deliberate mutilation for profit may still be seen in China. Cunhill describes a case of self amputation of the foot from Shanghai. I have seen one beggar in Chungking sitting outside a temple with his arms bound, while a scalp was a mass of keloid, into which were stuck [illegible] joss sticks. An enormous mass of keloid had obliterated the outline of the face below his cheeks, so that cheeks, chin and lower lip appeared all one. The contraction of this scar tissue had forced his head forwards, grossly distorted his mouth and produced the gross degree of trismus. The lower lid was more or less integral with the scar, but the eyes themselves and upper lids were unaffected. The strict limitation of the scar made it probable that such could not be other than deliberate, although I was unable to obtain a history.

I was told, but lack confirmation, that children used to be deliberately deformed by confinement of the body and limbs in constricting appliances, solely with a view to being a better qualified beggar. This is not quite so fantastic as it may sound to those not acquainted with the old China, where the beggars were so used to be within this generation an accepted part of society, amounting to a profession.

Mutilation for so thought cosmetic reasons is a common practice in the less civilized.

Mention has been made elsewhere of the Elizabethan appreciation of the broad brow. There is, in the Raffles Museum in Singapore, a life size tableau showing a Malay mother fixing an apparatus on the head of her baby, calculated to produce a flat forehead, locally considered a sign of beauty.

(*To be continued*)

Clinical Notes and Cases

A LARGE PREGNANCY TUMOUR OF THE GINGIVÆ

BY

Surgeon Commander (D) D. L. GOODRIDGE, R.N.

An exceptionally large oral pregnancy tumour has recently been seen and treated in a young Maltese woman. It is reported in view of its size and its classic pathological appearance both macro- and microscopically. Further there appear to be few if any reports of this condition in textbooks of pathology or obstetrics although mention is often enough made in dental textbooks.

Case History.—The Maltese wife of a locally enlisted soldier aged 20 and a primigravida was admitted as an emergency to the Female Wards of the David Bruce Military Hospital Malta with pre-eclamptic toxæmia albuminuria and high blood-pressure. The report of the Specialist in Obstetrics was as follows:

"Booked case. Delivered on the 17th March 1954 as a pre-eclamptic toxæmia with oedema albuminuria and a B.P. of 165/100. Catheter specimen of urine showed pus cells lactose fermenting coliform organisms and 3½ granules per litre of albumen. Acetone sugar—a trace. Blood Group—O. Rhesus positive. Kahn negative. Blood urea ~80 mg. per 100 ml. L.M.P. 13th June 1953. Primigravida."

Salt painless albumen attached to left upper alveolar margin size of a walnut.

Progress.—On low salt diet test Streptomycin 0·5 gramme b.d. and Mist. Pot. Cit. B.P. all uræmia steadily decreased and urine was sterile by the 27th March. Patient went home on the 23rd March after castor oil, bath and enema. Injections on the 20th and 22nd March. Progress of labour was normal and a 5 lb. 15 oz. male child born which asphyxiated at birth was delivered after twelve hours at 12·30 on the 24th March. The cuta was noted to be gritty. The toxæmia infection. Post-natal progress normal. Discharged on the 5th April 1954. Seen at post-natal clinic on the 1st April 1954. Condition excellent.

Three days after delivery she had a further oral examination. She stated that the swelling had first appeared in the third month of pregnancy and had gone on increasing in size. The oral mass was long, both on the buccal and palatal aspect of the maxilla and was pedunculated from between $\underline{|2}$ and $\underline{|3}$. The buccal part was just over ½ in. in diameter and flattened by the upper lip. The surface was glazed with slight stippling, reddish purple in colour and ulcerated with a greyish white slough where it had been abraded by the lower incisors.

The consistence was firm and nodulated. The palatal tumour was larger, about 1½ in. in diameter and almost round except where indented by the teeth. It appeared to arise from the palatal surface, springing from $\underline{|1}$ to $\underline{|2}$. There was about 2 teeth spacing between $\underline{|2}$ and $\underline{|3}$ which could be seen when the two lips were parted. There was no adenitis and nothing further significant in the mouth. The general paradontal condition was not good but not abnormal for the standard of hygiene of a peasant woman. It could not be said that she had a pregnancy gingivitis. A diagnosis of pregnancy tumour was made. It seemed unlikely that a tumour of this size would regress with the termination of the pregnancy. It was therefore decided to excise the aberrant tissue under general anæsthesia.

[illegible] considered to be fit for a general anaesthetic. [illegible] the patient [illegible] frequently traumatized. There was [illegible]. The photograph shows the [illegible] forceps and the [illegible]

[illegible] friable [illegible] 7 [illegible] the gingival [illegible] the [illegible] pedicle [illegible] bleeding was controlled [illegible] digital pressure [illegible] a mechanical pack [illegible] the gingival margin [illegible] an uneventful [illegible] The pack [illegible] days. One month later [illegible] and three [illegible] atrophied gingiva [illegible] still present.

The pathological [illegible] which is partly covered [illegible] vascular tissue [illegible] histological [illegible] in keeping with the [illegible] tumour.

Discussion

The name of pregnancy tumour was given to this condition by Blum (1931) who stated that the occurrence figure was 2 per cent in all pregnancies. The general gingival conditions in pregnancy have been studied extensively by Ziskin *et al.* (1933 and 1946) and Maier (1918). Their opinions shortly may be said to be that during pregnancy there is a spectrum of gingivitis stretching from normal gingivae through mild inflammation, moderate and severe inflam-

mation to [illegible] [illegible] groups is as follows

[illegible]	41 6 [illegible]
[illegible]	35 9 [illegible]
[illegible]	17 [illegible]
[illegible]	1 [illegible]
[illegible]	8 [illegible]

Beneath [illegible] [illegible] per cent with [illegible] [illegible] with gingivitis [illegible] He suggests the [illegible]

The clinical picture is universally given [illegible] authors is being bluish red or dark red in colour with greyish white ulceration where traumatized firm and liable to bleed easily if handled The size is given as seldom larger than [illegible] The condition starts between the 3rd and the 4th month of pregnancy The teeth are often parted and there is a predilection for the upper incisor region Hamblin (1947) gives microscopic descriptions which most nearly [illegible] with this present case with many capillary vessels and the spaces between filled with actively dividing peripheral cells Cross (1943) however reports very little vascularity and Maier states that the microscopic appearance [illegible] not vary much from the picture of pregnancy gingivitis except for an exaggeration of the proliferative conditions

There is much confusion of thought over the etiology of this condition Mann and Orban (1938) state that there is little significance in the percentage figures for incidence of gingivitis between pregnant and non pregnant persons and that the condition is inflammatory with modifications due to systemic disturbances

Hamblin states that endocrinologic metabolic and psychic disturbances are predisposing causes Cross suggests that it is caused by a combination of factors namely vitamin C deficiency hormonal alterations and local trauma Peel (1948) presents the view that pregnancy gingivitis is caused by a deficiency of utilizable oestrogen and further suggests the analogy that epithelial hyperplasia may be caused by an excess of chorionic gonadotropin It is felt that this condition is undoubtedly caused by an endocrinological upset coupled with an underlying local subgingival trauma

The treatment depends on the size of the tumour Many of the small ones spontaneously regress on termination of pregnancy In these cases there is no need for excision but simply careful cleaning and perhaps dosage of vitamin C are sufficient If excision is deemed necessary it is felt that electro surgery is the method of choice and would have been used if available in this case The excessive haemorrhage is thereby controlled Witheycombe (1939) very strongly recommends micro surgical coagulation It seems reasonable in view of the fact the condition is benign and there is no necessity to remove further than 1 8 in laterally beyond the limits of the pedicle that electric cautery of any type is desirable If surgical excision is done digital pressure followed by Wundrpack dressing or other mechanical pack is necessary

Preventive treatment should be based on early treatment of any signs of gingivitis during the first four months of pregnancy. If no signs of tumour formation have occurred by 4½ months it is unlikely that there will be any later growth. Steps should be taken to see that there is no traumatism and massage of the gums with oestrogen ointment might be of value at an early stage of hypertrophy.

SUMMARY

(1) A case of a large oral pregnancy tumour or epulis gravidae is presented with a description of the macroscopic and histological appearance.

(2) The incidence and aetiology of this condition is discussed shortly together with the suggested preventative and surgical treatment.

I am grateful to Lieutenant-Colonel R. L. Macpherson, M.B., Ch.B., D.R.C.O.G., R.A.M.C., who referred the case to me, for his interest, and to Lieutenant-Colonel R. S. Vine, M.R.C.S., L.R.C.P., R.A.M.C., Officer Commanding the David Bruce Military Hospital, for the facilities afforded me. I would like to acknowledge the permission to publish this report granted by the Medical Director General of the Navy.

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AN UNUSUAL ABDOMINAL EMERGENCY

BY

Surgeon Lieutenant-Commander P. D. G. PUGH, R.N.

The patient (labourer) was loading timber from a truck situated midway between two opposite doors. A gust of wind caught one of the boards which he was lifting, hurling the back and throwing him against the truck in such a way that he received a severe blow from a piece of timber across the abdomen. The lower abdomen.

He immediately experienced severe lower abdominal pain, agonizing at first but easing later. The accident occurred at 10.40 and the patient stated that at 11.00 he had emptied his bladder. He was admitted to the Naval Hospital at 1.30 and at that time stated that he still had severe lower abdominal pain, continuous but with intermittent sharp stabs, together with nausea. He had not vomitted. He had been unable to pass water since the accident.

Past History. — [illegible] 1934. Perforated duodenal [illegible] 1948 [illegible] suture. Left [illegible] 1952 for which he [illegible]. He [illegible]

Examination. — [illegible] He was aged 56 and [illegible] looked [illegible] Pulse 80 [illegible] Blood pressure 140/80. [illegible] There were scars of the previous [illegible] No [illegible] could be found. [illegible]

[illegible]

[illegible]

[illegible]

DISCUSSION

[illegible] The presence of [illegible] in the absence of [illegible] in the upper [illegible]

[illegible] It appears that when traumatic perforation [illegible] the hernia is always an inguinal [illegible] more often on the right [illegible] than the left [illegible] of long standing [illegible] and is only

[illegible] Moreover the [illegible] the [illegible] the [illegible] hernia [illegible] Interaction [illegible] the point is usually [illegible] time of the accident

Various theories have been propounded to explain why the presence of an inguinal hernia which may be empty should be associated with traumatic rupture of a loop of ileum lying close to the internal inguinal ring when the force of the injury is applied to the abdomen at a site distant from the hernia The most acceptable one seems to be that if one loop of ileum is applied to the internal opening of a hernial sac at a time when there is a sudden rise in intra-abdominal pressure then that part of its wall which is unsupported may burst Nevertheless even this theory does not fully satisfy our case in which there were two penetrations even though these penetrations were very close to each other

My thanks are due to Surgeon Rear Admiral R W Musson C B E B I Q H P R N for his kind permission to publish this article

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AN UNUSUAL CASE OF DIABETES MELLITUS

by

Surgeon Lieutenant M E CARPENTER R N

DIABETES MELLITUS is a fairly common complaint found among the Indians Chinese and Malays in H M Naval Base Singapore but the case described below is considered to be of sufficient rarity to be of general clinical interest being one of those unusual examples of diabetes requiring a high dosage of insulin when sudden falls of blood sugar precipitate severe hypoglycaemic reaction

[illegible] Medical Officer [illegible] Naval Base Singapore [illegible]

While [illegible] this [illegible] by [illegible] Hospital [illegible] [illegible]

The first point of interest to emerge was that his blood sugar level during coma was always extremely high even when he was well with no symptoms of hyperglycaemia or diabetes

The second feature was that any attempt to reduce this blood sugar level to any position much below 400 mg per cent (i e by the gradual increase of insulin dosage) resulted in its precipitant fall to below 60 mg per cent and the rapid onset of hypoglycaemic coma In this way frequent recurrences of hypoglycaemic coma other than the hypos which he has been able to control himself by taking glucose by mouth in time have repeatedly brought

him [illegible] The attacks have always been [illegible] treatment [illegible]

[illegible] some degree of liability [illegible] renal threshold for glucose in this man is very high [illegible] blood sugar has been about 300 mg per cent when a specimen of urine passed at the same time has been free of sugar A further example of this high threshold can be given on a day when he was showing symptoms of diabetic pre coma the blood sugar was 640 mg per cent yet the urine (passed at the same time) was only orange to Benedict s test and no ketones were present in the urine

His sensitivity to insulin has shown some variation and requirements have fluctuated between the considerable figures of 80 and 120 units daily usually about 90 units in divided soluble and protamine zinc insulin given as separate injections at the same time (10 30 a m —half an hour before the main meal of the day) If in coma he required 150 to 200 units of soluble insulin during twenty four hours

Food is of necessity a modified rice diet with additional protein in the form of meat eggs and fish but with less rice than in the normal full Indian diet which is standard for the hospital The main meals are at 11 0 a m and 5 0 p m and as a diabetic he also has a snack breakfast and supper of bread and butter or cheese at 8 0 a m and 8 0 p m respectively with a cup of tea without milk or sugar He has been educated sufficiently to realize the importance of maintaining a diet and scheme of meals closely similar to that of the ward when he is discharged home

In a case as this it has been necessary to modify one s views as to normal carbohydrate metabolism Thus far this man s normal blood sugar (and here one uses the word normal advisedly to refer to what appears to be a distorted physiological make up) would appear to be 280 or 300 mg per cent Moreover one is forced to regard him at this point to be balancing as it were on a knife edge between hypoglycæmia and hyperglycæmia

This patient has pre senile diffuse cataract the left side being more advanced than the right and these are advancing slowly in severity Otherwise no other typical complications of diabetes have been discovered Normal blood pressure is 140/90 No evidence of nephritis at any time

He also shows pronounced vitiligo over the face and parts of the trunk and limbs This condition is extremely common in Indians but in the case quoted it appears to be very advanced the affected areas being quite pink in colour and sharply contrasting with the remaining skin s *café au lait* hue This is the most pronounced case of vitiligo in an Indian known to the writer and as far as he knows the condition has no causal relationship to the diabetes

I should like to express my gratitude to S B P O Rogers and S B P O [illegible] Billings and the staff of the Pathological Laboratory who were of constant and invaluable assistance in carrying out the many blood sugar estimations

My thanks are due to Surgeon Captain P B Jackson for permission to publish the case

THE ROYAL NAVY MEDICAL CLUB

[illegible] Medical Club Dinner held in the Royal College, Greenwich, on the 3rd April 1954

The Royal Navy Medical Club has as its object the bringing together of [illegible] and dental officers who are serving or have served in the [illegible] Navy, the Royal Naval Volunteer Reserve and consulting specialists [illegible] Navy [illegible] once a year at the Royal Naval College, Greenwich.

Eminent men in service and civilian life are invited each year as official guests.

Serving members of the Club wear uniform at the Annual Dinner and those who wish may stay the night at Greenwich for a very small cabin fee. The cost of the Dinner includes wine before and during dinner and members may invite their own guests. In this connection it will be appreciated that charges at the Naval College, Greenwich are reduced to a minimum and are very considerably less than those of any civilian restaurant.

Securities held by the Club provide a small annual income which is used to pay for the entertainment of the Club's official guests and also to subsidize the price of tickets of attending members.

In the last [illegible] years there has been an [illegible] increasing number of junior officers of the Navy, Army and Royal Air Force joining the Club. The Committee welcome the [illegible] of junior officers and hope that [illegible] will continue. Every effort is made in arranging the seating at the Dinner to ensure that younger officers are placed among their contemporaries and repeats of members to sit together are always met.

Medical and dental officers wishing to join the Club are required to pay one life subscription of £2. This should be sent to the Hon. Secretary, the Royal Navy Medical Club, Medical Department of the Navy, Queen Anne's Mansions, St. James's Park, London, S.W.1.

On joining the Club, members receive a list of members of the Club and each year a circular in January relating to the Annual Dinner, which is held in April.

Reviews

[illegible] Balance in Surgical Practice. By [illegible] P. Le Quesne, M.A., B.M., B.Ch. (Oxon.), F.R.C.S. (Eng.), Assistant Director, Department of Surgical Studies, Middlesex Hospital. 1951. Pp. 130. [illegible] with 41 illustrations. London: Lloyd Luke (Medical Books) Ltd. Price 17s. 6d.

[illegible] Fluid Balance will be found a measurable value for all those [illegible] in the Navy. It is of particular value [illegible] deficiencies in Fluid Balance and methods [illegible] the matter so thoroughly, the [illegible] carried out on this subject of [illegible] this [illegible]

[illegible] of normal Fluid Balance and [illegible] is feasible, but a great deal further research is necessary [illegible] published [illegible]

[illegible] to the Surgical Sections [illegible]

[illegible] British Medical Association. 1954. Third Series. Pp. 217 + xi. [illegible] Price 7s. 6d.

[illegible] Little [illegible] The book gives an easy access to a very wide [illegible] and [illegible] the thoughtful [illegible] study worth and [illegible] from which the books take [illegible] This [illegible] is so well known that a fuller [illegible]

[illegible] the chapters of the [illegible] quickly [illegible] a valuable [illegible]

[illegible] Hansen, 1950. [illegible] Pages 12–64.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] unland 600 [illegible] Birkhuhn [illegible]

As [illegible] roe deer [illegible] Wild Forest [illegible] Forestry Commission [illegible] in Great Britain [illegible]

The book is [illegible] and three maps.

A book all [illegible]

A Textbook of Mammalogy. [illegible] Second Edition. [illegible] 1954. [illegible] Pages [illegible]

A textbook [illegible] about [illegible] except [illegible] and her [illegible] After [illegible] then [illegible] and [illegible] examination [illegible] and international [illegible]

When [illegible] remarkable [illegible] that the [illegible] is of living [illegible] is intended [illegible] some [illegible] the [illegible] the [illegible] emphasized [illegible] emphasize the [illegible] more [illegible]

[illegible] NERVOUS SYSTEM. By [illegible] Mitchell Bruce, M.D. [illegible] F.R.C.P. [illegible] pp. xx + 428, with 145 illustrations. London [illegible] 1904.

Mr. [illegible] however, was a clinical clerk at the National Hospital [illegible] higher examinations, he was given the opportunity of [illegible] Clinical Examination of the Nervous System. He has [illegible] the book. He has not regarded the subject [illegible] examination of the nervous system [illegible] than the [illegible]

[illegible] that this information is [illegible] practitioner [illegible] that gives this book its special importance. Although [illegible] there are few interesting [illegible] general [illegible] perusal of this book by the [illegible] interesting.

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Although [illegible] of the excellent book published in 1896 [illegible] Now that it has attained this should not be [illegible]

[illegible] the most important progress [illegible] [illegible] this [illegible] There is much [illegible] that should be [illegible] and psychiatrists. The section on [illegible] should be read by all who [illegible]

[illegible] that the bibliography of the [illegible] the index [illegible] the work called in the text. [illegible] blamed for [illegible]

[illegible] SYPHILIS. By D. [illegible] M.D., F.R.C.P. Consulting Physician [illegible] Department of Medicine and Medical Officer in Charge, Venereal [illegible] than. The Hospital for Sick Children, Great Ormond Street. London. 1904. pp. [illegible] Edward Arnold (Publisher). Price 20s. 6d.

[illegible] has drawn on his wide experience [illegible] in the writing. This book—which [illegible]

[illegible] syphilis covered by the [illegible] chapters [illegible] diseases.

[illegible] Hospital [illegible] good paper. [illegible]

[illegible] Medicine. By Maurice [illegible] M.A., M.D. [illegible] 1904. pp. xx + [illegible] illustrations. London: [illegible] 81. 6d.

[illegible] of the chest requires [illegible] [illegible] balance [illegible] [illegible] the exercise [illegible] [illegible] the practical [illegible]

[illegible] has remained unchanged [illegible] their time and there [illegible] This history [illegible] the social element and [illegible] without a pointer of the [illegible]

[illegible]

[illegible]

[illegible] Triple [illegible] Finally [illegible] Finally [illegible] the bibliography [illegible] the bibliography [illegible]

The binding [illegible] through irritable [illegible] 183 [illegible] of French [illegible] It is well [illegible] and the X-rays are clear and [illegible] their points [illegible] The above criticism [illegible] it is perhaps the best [illegible] textbook on the subject [illegible] be recommended

We acknowledge with thanks receipt of the following publications

Annales de la Faculté de Médecine Montevideo *Annales Medicinae Internae* [illegible] *Annals of Tropical Medicine and Parasitology* *Australian Journal of Experimental* [illegible] *and Medical Science* *British Medical Journal* *Brotherhood* *Bulletin International Sciences* *Chinese Journal of Medical Sciences* *Guy's Hospital Gazette* [illegible] *Forces Medical Journal* *Journal of the Irish Medical Association* [illegible] *Army Medical Corps* *Journal of the Royal Naval Scientific Service* *Medical Journal* [illegible] *Australia* *Medical Journal of Osaka University* *Medical Press* *Medikinsen Hoppo Journal* *Military Surgeon* *Proceedings of the Staff Meetings of the Mayo Clinic* *St Mary's Hospital Gazette* *St Thomas' Hospital Gazette* *Tohoku Journal of Experimental Medicine* *Tropical Diseases Bulletin* *Studies in Medicine* *Medical Society Bulletin* [illegible] *States Armed Forces Medical Journal* *United States Medical Technicians Bulletin*

MEDICINE ILLUSTRATED MEDICINE IN THE ATOMIC AGE Vol 8 No 11 1954

THE DISEASES OF DENTAL IMPORTANCE by R W Durnford M R C S L R C P and H Morgan L D S L R C S Published by Hodder and Stoughton Medical Publications London

NUFFIELD HOUSE OF LORDS REPORT 1954 Published by University Press Oxford

NUFFIELD HOUSE OF LORDS REPORT OF CASES 1943–1954 Published by University Press Oxford

News of the Service

BIRTH

[illegible] WEN.—On 11th November 1954, in Malta, to [illegible] J. R. Lauriner Owen, Royal Navy, a [illegible]

OBITUARY

[illegible] RICKARD, R.N. (Ret.). He was born [illegible] he qualified in 1900 and entered the R.N. M[illegible] He was promoted to Staff Surgeon in D.S.S. [illegible] the Retired List (age) in 1925 with the rank [illegible] Surgeon Capt. Rickard served in H.M. Ships [illegible] and [illegible] W.W. II he was recalled to the Navy and served in the rank of Surgeon [illegible] R.N.V.R. Staff Surgeon from August 1939 until [illegible] then [illegible] list.

[illegible] M. CAMERON, R.N. (Ret.), died in the [illegible] 1954 [illegible] 1853 he qualified in 1896 and entered the R.N. Medical Service as [illegible] 1897. He was promoted to Staff Surgeon in 1905, Surgeon in 1911 [illegible] placed on the Retired List (on his own request) in May 1926. [illegible] World War I Surgeon Commander Cameron served in H.M.S. [illegible] and in [illegible] Department, Admiralty.

Surgeon Rear-Admiral Frank Hutton NEMMO, M.V.O., died in the 15th November 1954, at the age of 82. Born on 13th June 1872, he was educated at Mill Hill School and St. Bartholomew's Hospital Medical School where he qualified M.R.C.S., L.R.C.P. in 1896. He joined the R.N. Medical Service on 10th November of the same year. He was promoted Staff Surgeon in 1904, Surgeon Commander in 1910, Surgeon Captain in 1922, and Surgeon Rear-Admiral in 1926. He retired at his own request on 20th June 1926.

Surgeon Rear-Admiral Nemmo served as medical officer in H.M. Yachts *Osborne* and [illegible] from 1908 to 1914. He then served in H.M.S. *Tiger* during World War I and [illegible] continued service in Royal Yachts from 1919 to 1924, in which year he was promoted M.V.O. [illegible] Surgeon Captain. During the latter years of his service on the navy he [illegible] the medical section in Malta.

Surgeon Commander N. L. McDONNELL, R.N. (Ret.), died on the 1st December [illegible]. Born on the 21st October 1896, he qualified in 1921 and entered the R.N. Medical [illegible] Surgeon Lieutenant in September 1924. He was promoted to Surgeon [illegible] Commander in 1929, Surgeon Commander in 1938, and was placed on the [illegible] on the 20th September 1946.

During World War II Surgeon Commander McDonnell served in H.M. Ships *Manitoba* [illegible] and in R.N. Barracks, Chatham, H.M. Dockyard, Alexandria and H.M. Naval [illegible].

Surgeon Lieutenant-Commander B. J. HOARE died suddenly at his home on [illegible] 30th October 1954.

[illegible] Hoare was born in 1888 at Ipswich, the Sick Bath Staff [illegible] Hospital, Bagdad, during the difficult Dardanelles [illegible] the First World War. His name was mentioned in despatches for the Sinai [illegible] the very rapid promotion for his *esprit de corps* he devoted [illegible] and [illegible] Turing extreme pressure of work in 1915-16. He was [illegible] in 1927 and after serving in several hospitals [illegible] 1954. We last saw him as secretary to the Surgeon Rear-Admiral of [illegible] he was promoted to Warrant Lieutenant in 1937 and the [illegible] *M.B.E.* and subsequently placed on the retired list through [illegible]

[illegible] and World War [illegible] Hours was [illegible] the Surgeon Rear Admiral [illegible] Royal Naval Hospital [illegible] the latter [illegible] Winchester [illegible] 1945. He [illegible] 1947 [illegible] property as [illegible]

[illegible] Health [illegible] Hon. [illegible] The [illegible] Consultant [illegible] Surgeon [illegible] The [illegible] few [illegible] He [illegible]

HONOURS AND AWARDS

Companion of the Order of the Bath

Surgeon Lieutenant-Colonel J. Hamilton, C.B.E., M.B., Ch.B., D.P.H., S.

Member of the Order of the British Empire

[illegible] J. H. B. Crosby, M.B., B.Ch. (Retd.)

Member of the Order of the British Empire

Surgeon [illegible] W. Huggett, M.B., B.Ch.

Polar Medal

Surgeon Lieutenant-Commander J. L. Marrison, M.B., Ch.B., D.O.M.S., R.C.S. [illegible] Commander, Royal Navy. July 1952–August 1954.

Queen's Honorary Physician

Surgeon Captain A. H. Harkins, M.B., B.Ch.

Queen's Honorary Surgeon

Surgeon Captain D. H. Kernohan, M.B., B.Ch.

Queen's Honorary Dental Surgeon

Surgeon Captain D. R. M. Parkyson, C.B.E., L.D.S.

Royal Red Cross

Matron H. M. [illegible] Principal Matron, Q.A.R.N.N.S.

PROMOTIONS

To Surgeon Rear-Admiral: Surgeon Captain A. A. [illegible], O.B.E., [illegible]

To Surgeon Captain: Surgeon Commander J. M. Riesse, O.B.E.

To Surgeon Commander: Surgeon Lieutenant-Commander H. W. L. Brigham, W. Hobgate, O.B.E.

To Surgeon Lieutenant-Commander: C. A. S. Anthony, E. R. Ashton, K. S. [illegible], M. Chico, [illegible] W. Lyell.

To Surgeon Lieutenant: B. L. S. Popham.

To Assistant Dental Surgeon Commander: G. M. Barr, [illegible], O.B.E.

To Surgeon Lieutenant-Commander: S. D. Walsh.

TRANSFERS TO PERMANENT LIST

Surgeon Lieutenants—J. B. Kemp, J. D. Ross, D. Waddington, R. R. A. [illegible], R.N.V.R.

Surgeon Lieutenant (D)—R. L. Evans.

RE-ENTRY TO PERMANENT LIST

Surgeon Lieutenant-Commander (D)—C. B. Wray.

ENTRIES FOR SHORT SERVICE COMMISSION

[illegible] Cripps M.B., B.S., J. M.S.S.A. R. J. Knight M.B., B.Ch. D. H. Mary [illegible] M.I. [illegible] R. [illegible] M.R.C.S. Patricia McDonald M.B., B.S. D. R. B. Menils M.B., C.H.B. [illegible] M.B., B.S. I. C. Ware M.B., B.S. J. A. H. Wylie M.D. D.H.L. [illegible] B.S. [illegible] Burl L.D.S.

RETIREMENTS

[illegible] Lieut. R. G. Anthony. J. I. H. Grossen. Surgeon Captain (D) I. H. [illegible] [illegible] Cochrane. Cranles. Spero. Surgeon Lieutenant Commander [illegible]

WARDMASTER OFFICERS

PROMOTIONS

[illegible] Lieutenant—I. J. Carter. V. C. Mitchell.

[illegible] Wardmaster—K. R. Avery.

RETIREMENTS

[illegible] Lieut. I. D. Jarrett. Senior Commissioned Wardmaster W. J. H. [illegible]

JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE
ANNUAL REPORT 1954

Balance Sheet

Assets	£	s.	d.	Liabilities	£	s.	d.
[illegible] Bank 31.12.54	242	17	4				
[illegible] Stamps in hand							
[illegible]	1	14	6				
[illegible] Stock	100	0	0				
[illegible]	600	1	0				
[illegible] Investments							
[illegible]				1955 Subscriptions [illegible]			
[illegible] 1951	1	14	0	advance	36	9	0
[illegible] 1951	76	14	0	Balance Creditor	921	14	4
	£1,026	2	3		£1,026	2	3

Audited and found correct.

S. V. Ellison, Lieutenant (S) R.N.

ADMIRALTY FLEET ORDERS

(This page is perforated for filing.)

Notice

[illegible] officers to send in original papers on professional subjects, travel [illegible] &c. Items of news and matters of interest to the medical [illegible] are solicited from ships and establishments on home and foreign stations [illegible] marriages and deaths are inserted free of charge to subscribers.

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Royal Naval Medical School, Alverstoke, Hants.

VOLUME XLI SPRING 1955 No 2

Journal of the Royal Naval Medical Service

Articles

INDUSTRIAL HEALTH IN H.M. DOCKYARDS[1]

BY

Surgeon Commander G H G SOUTHWELL-SANDER R N

INTRODUCTION

I have chosen for the subject of this paper "Industrial Health in H M Dockyards" for two reasons firstly because industrial health or occupational health if the more comprehensive term is preferred is very much in the forefront these days and secondly because the Royal Dockyards are among the very biggest employing industries in the country A study therefore of the medical organization required to meet the needs of a great body of workers and some of the medical and health problems which are met with in a big industry should be of interest to those of us here whose outlook is if I may say so focused more on the preventive aspect of medicine and whose interest lies particularly in the field of industrial health The enormous expansion of industry in the last war and the introduction of many new processes some of which were potential hazards to health required a corresponding development in medical organization and knowledge This expansion occurred not least in the armed forces and as a result the importance of occupational health in the forces has greatly increased Moreover the civilian employee in industry has become—and rightly so—ever more clamant that the fullest medical facilities should be available to him at his work The Admiralty employs a very large number of civilians both at home and abroad on occupations similar to those found in industry outside and the largest establishments employing this labour are the Royal Dockyards

I would like it to be understood that what I have to say in detail in this paper refers to H M Dockyard Portsmouth on which alone I am qualified to speak but what I say in general can I think apply to nearly all the Home Dockyards

There are six Home Dockyards—Portsmouth employing altogether over 13 000 workers Devonport 21 500 Chatham 11 000 Rosyth 6 000 Sheerness 3 000 and Portland 2 800 There are also the Dockyards abroad at Malta

[1] A paper read before the Services Group of the Society of Medical Officers of Health on 26th November 1954

Gibraltar Trinidad Singapore Hong Kong and Simonstown with their particular problems associated with work in hot climates and the employment of workers of different races but of these there is no time to speak to day

In order to understand the medical organization of a big industry and the problems which arise from it it is necessary to know something of the development the function and scope of the industry as a whole And so I must devote a little time to a description of the development and set up of Portsmouth dockyard For these preliminary remarks I am indebted to a paper from which I would like to quote written by a former Admiral Superintendent of Portsmouth dockyard Admiral Sir Llewellyn Morgan and also to the 8th and 9th Reports of the Select Committee of Estimates which reported on the dockyards in 1950–1951

History

The history of Portsmouth dockyard dates back to the reign of King John (1199–1216) In those days the procedure for docking a ship was to draw her up as far as possible on the mud of a creek or other suitable place at high water and a temporary wall probably of mud was built round her after the tide had left Until 1299 in the reign of Edward I Portsmouth continued to be used for the assembly of ships on various occasions but for the next 200 years there is little of interest in the records until the time of Henry VII In the face of a renewed threat from France Henry VII built many fortifications at Portsmouth and the first dry dock ever made in England—perhaps in the world—was begun in 1495 The placing of the dockyard on a permanent basis dates from the Commonwealth and from 1649 Commissioners were appointed Even so the dockyard was very small and as late as 1650 not more than 100 shipwrights and one team of horses were employed' Rapid progress and much building was done when the saviour of the Navy Samuel Pepys was Secretary to the Admiralty During the eighteenth century a wall much of which remains to this day was built round the Dockyard and during this century there was continuous growth which went on right up to the time of the French Revolution and through the Napoleonic Wars until the end of 1815 Though the yard suffered from three disastrous fires—the last one in 1776 due to sabotage for which the culprit a labourer known as Jack the Painter was condemned to death and hanged near the main gate—many of the present buildings date from this period of the eighteenth century In 1845 the size of the dockyard was 8 acres now it is more than 300 acres Now there are 14 docks and 4 locks 1 floating dock and various boat slips and a vast number of ships storehouses and offices of different sizes some very old others modern These have grown up in a haphazard way through the years as the need for them has arisen so it has never been possible to plan the layout of the yard to the best advantage And so to day there is a fine assortment of the old and new There are workshops and stores dating back to the eighteenth century—one of them the block mills has the original machinery installed there in 1803 still working as no more efficient modern machinery has been devised to do the particular work—and there are up to

[illegible] the big factory doing light [illegible] employing nearly [illegible] men under one roof and a [illegible] electrical shop with all the newest devices and equipment [illegible] working conditions

A steady and regular building of large naval ships was continued in the dockyard from early years right up to the latter part of the Great War the last battleship built there was the Royal Sovereign in 1917 The increase in size of capital ships now makes the building of them in the dockyards impossible and the work on ships is now chiefly devoted to reconstruction refit and repair Some smaller ships however such as frigates are on the stocks at the moment

Function

But this work on ships is by no means the sole work of the dockyard There are altogether four main ones firstly the ship work just mentioned the average number of ships at any one time in the yard is about 70 The next function is to look after the navy s shore establishments in the Portsmouth Command of which there are over 140 though not entirely responsible for the upkeep of all these establishments the responsibility is considerable The third function is the provision of stores ammunition food and clothing for a large part of the navy—for instance the victualling department is responsible for providing clothing and food for some 35 000 officers and men Finally the dockyard has to look after its own extensive services—maintenance of docks, workshops cranes railways etc

Organization

How is the dockyard organized to deal with all these functions ? There are a number of self contained departments each working with the other departments but each almost an independent factory or store under its own manager The head of a department has considerable independence in the running of his department subject to the overall control of the Admiralty and the Treasury The heads of departments are responsible to the Admiral Superintendent for the efficiency of their departments The Admiral Superintendent exercises general supervision over all business carried out by departments and is responsible for the observance and execution of all Admiralty regulations and most important he keeps a balance between the essential requirements of the Fleet and the capabilities of the dockyard

The superintendent of the dockyard has as his deputy the Captain of the dockyard who as Queen s Harbour Master is responsible for the berthing and mooring of all vessels using the port The Captain of the dockyard is also responsible for the movement and berthing of ships alongside or within the dockyard and for seeing that proper amenities are provided for officers and men He controls the tugs mooring vessels yardcraft transporting arrangements generally and is responsible for the care and maintenance of all ships paid off into dockyard control the majority of the officers in the Captain s department are naval officers but civilians are employed for the supervision

of the industrial work for which the Captain of the dockyard is responsible rigging and making and rigging work

For its primary productive work the dockyard is divided into three main departments the *Constructive Engineering and Electrical Engineering Departments*

Each of these departments is under the charge of a manager who has broadly the same status and authority as a manager in private industry The managers of the Constructive and Electrical Engineering Departments are senior civilian officers The manager of the Engineering Department is a naval officer holding the rank of Rear Admiral (E) or Captain (E)

The managers are responsible for all the administration detail of their departments including the employment of labour and the supply and use of materials

The management of these three main departments is assisted by technical staffs which in the case of the Constructive and Electrical Engineering Departments are for the most part civilians with professional qualifications and in the case of the Engineering Department are naval officers who have been specially trained in marine engineering and have the advantage of their sea experience as users of the ships the dockyards have equipped and refitted The technical staffs are assisted by civilian subordinate staffs comprising foremen and inspectors who have under them the industrial labour force of the department which is divided into groups each under a charge man

The industrial activities of the main departments of the dockyard extend beyond their primary work of ship construction and repair The dockyards supply and repair the equipment of naval shore establishments including Royal Naval Air Stations They manufacture and repair a wide range of electrical equipment utilities radio and gunnery equipment and such a miscellany as oxygen distilled water paint and flags They operate graving docks floating docks railways steam and motor boats and tugs They maintain all their own equipment and machinery

In addition to the main departments of the dockyard the following local departments are also under the general supervision of the Admiral Superintendent for the day-to-day business of the yard

The Civil Engineering Department responsible subject to the general directions of the Civil Engineer in Chief at the Admiralty for the building and civil engineering work required in the dockyard and outlying establishments

The Naval Store Department under the local charge of a Superintending Naval Store Officer who receives his general directions from the Director of Stores Admiralty and is responsible for the performance of the naval store duties required in the command These duties include supply of naval store items required and the operation and maintenance of motor transport The Superintending Naval Store Officer is also responsible for all naval oil fuelling operations and transactions carried out in the area

The Cashier's Office responsible for all cash work in the yard including all receipts and payments of cash and payment of wages [illegible]

The Expense Accounts Department under the Inspector of [illegible] is responsible for the recording and costing of all work [illegible] Where the clock mustering system is in force this department also undertakes calculation and payment of wages

The Dockyard School under a civilian headmaster and staff run primarily for the training of dockyard apprentices

At the small dockyards the superintendent is frequently of the rank of Captain R.N. and the ranks of the officers in charge of the various Departments are usually lower than those in the big yards (e.g. a Commander of the Dockyard, a Chief Constructor, a Naval Store Officer, etc.)

At each dockyard there is a District Committee of the Admiralty Administrative Whitley Council composed of most of the heads of departments and representatives of the various non-industrial staff associations to which members of the dockyard staff belong.

There is also a complete system of Industrial Committees on the Whitley model which are fully representative of the management and workpeople at shop, departmental and yard levels.

The Royal dockyards subscribe to the statutory regulations laid down in the Factories Acts and the regulations and orders made under those Acts. The factory inspector of the area, and on occasions the medical inspector of factories, visits the dockyard and advises the management on the application of legislation to the safety, health and welfare of the worker.

And so at last but by no means least in importance we come to the medical department, which primarily is the subject of this paper. You may have wondered if I was ever going to get to it, but as I said at the beginning, some knowledge of the development and setup of the dockyard as a whole is essential before the type of work and the conditions of work can be visualized and the functions, responsibilities and problems of the medical organization appreciated.

Aims of the Medical Service

The aims of the medical service in the dockyard are those of an industrial health service as a whole, and I cannot do better than quote from the report of a Committee on Social and Preventive Medicine set up in 1943 by the Royal College of Physicians. This committee stated that the main objectives of an industrial health service should be:

(*a*) To promote the general health of the worker by the provision of a good working environment and by fitting the worker into that environment.

(*b*) To prevent occupational disease.

(*c*) To assist in preventing injuries at work.

(*d*) To organize and supervise a service for the emergency treatment and care of injured and sick workers at their place of work.

(e) To take an active part in the restoration to full capacity of workers disabled by injury or disease and resettlement of workers suffering from permanent disability

(f) To educate the workers in the preservation of health and promotion of well being

(g) To promote research and investigation

Note the stress on the preventive aspect of the service Let us now consider briefly the organization of the medical department in the dockyard and see how it meets these aims

Commitments

Our commitments extend to all workers in the dockyard and we have medical responsibilities to workers in outstations under the administration of the Admiral Superintendent Out of a total civilian labour force of over 25 000 only about 2 000 are non industrials Seventeen thousand are actually employed within the dockyard area the remainder in nearby establishments As there are only 850 females employed no special medical facilities for these are required Age groups range from 15 to over 70 There can be few of any industries in the country which employ a greater number of workers under one roof so to speak as are employed in Portsmouth or Devonport dockyards Indeed it has been said that the *Constructive* departments alone at Portsmouth Devonport and Chatham are comparable in size with the 60 largest factories in the country ! This will give you some idea of the extent of our medical commitments The size of the dockyard the complexity of the organization the age of many of the buildings and the varied work carried out adds to the difficulty of providing the best possible conditions of health for the large number of workers and gives rise to many problems

Medical Organization

The medical department is housed in the surgery which is situated centrally in the dockyard The buildings comprise a large waiting room area a senior medical officer's room two consulting rooms for medical officers a large casualty room a dispensary offices an X ray room and a dark room store rooms and a mess room for the staff The building is compact the rooms well fitted and all necessary facilities are available There is good access for ambulances

The staff consists of the senior medical officer two assistant medical officers a senior surgery assistant 7 surgery assistants (all males) a typist, a messenger and a cleaner

The surgery is fully manned during working hours (the dockyard works a 44 hour week Monday–Friday) and is open for casualty reception with two staff on duty until 8 p m on working days and until 4 p m on Saturdays This extra attendance is necessary as considerable overtime is worked on the average 2 000 men are employed overtime during the week and on Saturdays A medical officer is on duty day and night to cover any emergency This is no hardship as two medical officers have residences within the yard and the

third one if a bachelor is also accommodated in an officers mess inside the yard. The size of the staff is adequate and I do not consider three doctors excessive. Indeed the Government Report of a Committee of Enquiry on Industrial Health Services published in 1951 mentions a ratio of one full time doctor to 3,000–5,000 workers where special hazards are *not* present (and they are present in the dockyards). The equivalent figure in the French industrial health code is apparently one to 3,000. The committee go on to say that they had no reason to regard such a ratio as extravagant for large undertakings which employ several thousand workers. The need for these duties in a dockyard the size of Portsmouth will be seen more clearly when I describe their duties.

Senior Medical Officer

The Senior Medical Officer. He is of course responsible to the Admiral Superintendent for the medical organization of the dockyard and acts as his adviser on all medical matters under his administration. In addition to the dockyard itself there are some 30 associated establishments, most of which are in the neighbourhood, but a few some considerable distance away, for all these we have some medical responsibility and they are visited from time to time.

By virtue of his appointment as Appointed Factory Doctor under the Factories Acts, the senior medical officer is responsible to the factory department of the Ministry of Labour and National Service for the carrying out of statutory obligations such as the examination of all young persons under the age of 18 on entry and annually and special periodic examinations of persons engaged in toxic hazards such as chrome and lead. There are other statutory duties too in connexion with rendering reports. At Portsmouth the senior medical officer is Appointed Factory Doctor to the dockyard and to the R.N. Armament Depot at Gosport.

The senior medical officer usually deals with all compensation cases and decides on the invaliding of cases from the yard for which purpose the patient is usually visited at his home. Since the introduction of the National Insurance (Industrial Injuries) Act of 1948 claims for compensation under the old workmen's compensation acts are now dealt with by the Ministry of National Insurance and the Admiralty has no responsibility for claims under the Act. As a result the compensation cases dealt with are gradually getting less as only claims for injuries prior to the introduction of the Act are dealt with. Claims for compensation when the Admiralty are sued for negligence under common law, however, still call for examinations and reports.

Within the last few years there has been a very significant and important decision by the Admiralty on the appointment of the senior medical officer at the bigger dockyards. He is now appointed as senior specialist in hygiene and is selected from those who hold the D.P.H. and whenever possible the D.I.H. as well. If it is accepted that the medical function in industry is primarily preventive, which I believe it to be, then this appointment of a medical officer in charge trained in preventive medicine is obviously a very

[illegible] and the responsibilities increased. The senior medical officer must now devote much of his time to visiting the shops and workplaces and studying the conditions of work. He should acquaint himself with the hygienic conditions of workplaces, canteens, sanitary arrangements, the means of refuse disposal and so forth. These visits to workplaces and inspections of hygienic conditions in the yard should be followed when necessary by detailed reports with recommendations for improvements. These reports I have found are welcomed by the management; there is no doubt that a medical opinion carries great weight and the necessary funds are usually forthcoming when the demand for improvements is supported by a firm medical recommendation.

The visits by a doctor to shops and places of work, and the increased interest in the welfare of the worker, have been welcomed by the men themselves and the Whitley Committees have expressed their satisfaction.

With his special knowledge the senior medical officer is able to keep a vigilant eye on any special hazards of work, and the use of toxic substances which are potential hazards to health. I have only to mention the all too frequent misuse of solvents such as trichlorethylene or carbon tetrachloride or the use of patent compounds with little if any indication on the container that they contain toxic substances to show the need for a careful watch on the use of such compounds. And so there can be no doubt that if the fullest opportunity is to be taken of the scope offered in such a large and varied industry as a dockyard a special training in industrial health is essential for the senior medical officer.

I have perhaps laboured this point too long, nor do I wish it to be thought that in the past the medical officers never took any interest in the preventive side of the medical work in dockyards, but the added interest and knowledge of one trained in preventive and industrial health is bound to increase the scope of this work and add to the responsibilities, which is thus reflected in improvements for the health of the worker.

If these special duties are to be carried out successfully, it is essential that the senior medical officer should be appointed for a reasonably long tenure of office. In my experience it takes at least a year to cover once the whole dockyard area and the outstations in detail and to grasp the complexity of the organization. Time must be available to give thought to the medical problems insparable from a large industry and to plan and devise schemes for improvements which may be slow in fulfilment and which must be watched at every stage. Research in medical problems is usually long term and must not be neglected. Moreover the duties as Appointed Factory Doctor cannot be properly carried out if there are to be frequent changes of office. At present the senior medical officer is usually appointed for three years, but I venture to suggest that the advisability of a longer appointment must be considered. The best advantage is to be taken of the increased scope of the work. This appointment of a specialist in preventive medicine and industrial health results in important advance in Admiralty policy in the medical organization of H.M. Dockyards, and anticipates, I believe the time when the Government

may try to establish in big industries or groups of industries when the National Industrial Health Service comes into being. This policy should be of interest to any civilian medical officer of health who may be here to-day, as it seems to be the general feeling that he will play a very significant part in a future National Industrial Health Service.

Assistant Medical Officers

One of the medical officers is responsible for all the casualty work and treatment of attributable hurt cases, that is injuries received at work. The general rule observed is that all minor injuries occurring at work are treated as far as possible to finality. If hospital treatment is required they are sent to the R.N. Hospital at Haslar or to a civilian hospital. As attributable injuries may lead at a future date to claims for negligence on the Admiralty, it is desirable that these cases should be treated in a naval hospital, but there is no compulsion about this, and if a man for any good reason prefers to be treated in a civilian hospital or it is to his advantage, his admission there is arranged. Cases of illness caused by a man's work may also be sent to a naval hospital. The principle is that the Admiralty offers treatment to an employee if the injury or illness arises from his work.

The actual number of injuries occurring are surprisingly few, though what this can be attributed to I do not yet know. The frequency and severity rates which are those usually shown for industrial injuries have not been computed so far as the work involved is very considerable and accurate figures are very difficult to get—for instance an injured man may be treated by his own doctor and not at the surgery, as either he may prefer such treatment or he may think he may persuade his own doctor to put him off work, whereas the dockyard medical officer may consider him fit to carry on with his work. The result would be that the hours of work lost—which is an essential part of the calculation of severity and frequency rates—would be overweighted in the statistical results. The crude numbers of accidents are known. The number dealt with in the surgery in the second quarter of this year was 1,733, which works out at about 20 a day out of the industrial section of a working population of about 16,000 who are most at risk. Considering the variety and conditions of work this number is, I think, satisfactorily small. In addition there are almost equal numbers of very slight injuries dealt with at first aid centres at the workplace and not serious enough to be referred to the surgery and cause no appreciable loss of working time. In the same quarter these numbered 1,257.

First aid centres are situated in every big shop or workplace and are equipped with a suitable first-aid box under the charge of a volunteer. If there is any doubt about the seriousness of an injury the case is immediately referred to the surgery. Very recently it has been possible to substitute simple adhesive type dressings in the first aid boxes for the older wrapped bandage type; these are much more convenient and likely to stay on the wound. Steps are being taken to ensure that the volunteers in charge of the centres have received a course in first aid and refresher courses from time to time.

S[illegible] [illegible] types of injury seen in the surgery are [illegible] in the [illegible] to the eye from falling objects Many of these accidents could be [illegible] prevented if the workman would wear the protective appliances available Suitable goggles and eyeshields are provided to protect the eyes and boots or shoes with reinforced toe caps may be bought at a very reasonable price There are surprisingly few cases of industrial dermatitis the most common type is a follicular dermatitis due to oils rather than a dermatitis due to sensitizing agents

In the waiting room of the surgery I have arranged a show case with samples of all the different types of goggles eyeshields masks respirators gloves and protective creams which are available We hope that patients beginning their idle moments waiting to be treated will look at the exhibits and so the seed of preventive medicine may sometimes fall on fertile ground! Besides the treatment of injuries emergency treatment is given to all sick cases and these are frequent which is not to be wondered at considering a large number of workers are in the higher age groups These cases are often very interesting medically—cardiovascular cases are common acute surgical emergencies such as appendicitis in perforated gastric ulcers are not infrequent and in one week not long ago we had two cases in diabetic coma These cases are dispatched either to their own homes under their own doctor's care or straight to hospital as the case requires No treatment either than emergency is given to cases of illness not caused by work and these patients are invariably referred to their own doctor Treatment on behalf of the doctor may be carried out at his request where this is of advantage to the patient and saves loss of working time

Routine Medical Examinations

The third medical effect deals chiefly with medical examinations for entry into the yard (or establishment (i e those who become eligible for pension) for service overseas and the majority of periodic examinations for those engaged in work in which there is a special risk to health

The number of these examinations is considerable and amounts to over 1 300 in quarter Just a few words about each Entry examination—every man is medically examined on entry Though no standard is laid down except in a few special categories only fit men are normally entered This may sound contrary to the modern beliefs that—to quote again from the report of the Social and Preventive Medicine Committee of the Royal College of Physicians—

It is no business of the industrial medical officer to weed out all but the physically and mentally fit leaving the handicapped to find employment in some lower grade occupation where standards are low or non existent The principle governing entry examination should be to see that the man is fit for the work which he has to undertake New the work in the dockyard is usually very varied and the conditions of work are such that a worker has to be physically fit if he is not to be a danger to himself and to others For instance an electrical fitter may only require to do bench work for part of his working time but at any time he might have to do the work of his trade at the top of

is most at a warship and for this he must be a fit man. The duties of the installed labour in the yard is heavy manual work. This is not to say that men suffering from deformities or chronic complaints of one sort or another are not sometimes accepted—they are. When a department needs a skilled man for some particular work the normal standard of fitness on entry is lowered on the understanding that where necessary the man is employed in a restricted capacity. Moreover by the Disabled Persons Resettlement Act an intake of at least 3 per cent of disabled persons is required and in fact the percentage in the dockyard is about 5 per cent.

Medical Examination for Service Overseas. Besides the usual examination special enquiry is made into any past history of skin trouble ear complaints or other ailments which may be aggravated by hot climates. In every case a full plate X ray of the chest is taken experience has shown that too often minimal lesions of pulmonary tuberculosis not detectable by clinical examination only have broken down after arrival at a foreign station and the man has had to be invalided home with consequent loss of time and money.

Finally the periodic medical examinations. There is a long list of these and they can be divided into the Statutory examinations required under the Acts and examinations required by Admiralty regulations. The statutory examinations are those for young persons under the age of 18 on entry and annually and those employed in hazardous work such as chrome or lead. The examination of young persons is time well spent and continues the good work of the school medical officer. Care is taken to see that the work is suitable for the lad and any abnormalities detected are referred to the boy's own doctor to be dealt with. As there is an annual intake of about 500 young persons the examination for entry and annually provides a lot of work. I remember reading somewhere that the Association of Certifying Factory Surgeons once recommended that the work of the Appointed Factory Doctor (as he is now called) should be extended to include the re-examination of young persons up to the age of 20 or 21 and the examination of workers over 60 years of age. I am not sure that this further step of providing medical supervision from the cradle to the grave is not going too far and certainly we could not do it in the dockyard without an increase in staff. In the yard any industrial who wishes to continue at work over 65 can do so provided he remains efficient and in good health. No medical examination is done unless the department think there may be a medical reason for a man's unfitness to continue at work.

The examinations required by Admiralty regulations include those for certain lead workers such as those engaged in cleaning out leaded petrol tanks chrome workers foundry workers wet sandblasters furnace and boiler cleaners asbestos and X ray workers anti fouling painters divers etc. The opportunity has been taken recently to review all the periodic examinations and though the list is still a long one I feel that the examinations now done are worth while and in the best interests of the workmen. To take a few examples—the annual examination of foundry workers and wet sandblasters includes a full plate X ray of the chest (these chest X rays are all done at

R N Barracks) and the results have been very interesting and some times and a little disturbing showing the need for taking every precaution to improve the conditions of work in foundries as good as possible The process of wet sand blasting which consists in spraying a jet of wet sand under pressure to clean ships bottoms is a relatively recent introduction and is causing concern owing to the amount of dust distributed over a wide area Workers with anti fouling paints used to reduce the growth of marine organisms on ships are examined as one of the compounds used is tricresyl phosphate whose toxic properties may produce a paralysis of the limbs Asbestos workers have an annual X ray of chest and X ray workers have a periodic blood count which is done at the Royal Naval Hospital Haslar

The value of a periodic examination has often been argued about but used wisely and with a critical regard to what the examination can achieve it is I believe worth while and though it may not always prevent harm to the worker it may detect poisoning in its early stages To shew how necessary is a constant review of all periodic examinations I would like to quote the examination of red lead workers that used to be done in the dockyard In years gone by red lead was used extensively in ships and the danger of handling the paint may have been considerable as a result a regulation was issued directing that all men handling red lead were to be examined fortnightly With the passage of time the numbers coming to be examined included all painters, until when I first arrived at the dockyard I was horrified to see monthly 800 men solemnly lined up in a seemingly endless queue present themselves in turn before the medical officer who was stationed behind a wooden table In turn every man pulled his lips apart with his fingers to display his gums which frequently were unadorned by any teeth at all and then his fingers contaminated with saliva were pressed on the table top to demonstrate any muscular weakness of his hands Now I am glad to say this unhygienic pantomime has ceased and the examination carried out in a seemly manner is confined to those few painters who handle red lead regularly Red lead is now little used in ships But this example does show how important is a constant review of periodic examinations Custom the passage of years the whims of a particular medical officer pressure maybe from the workers may all be factors in the introduction of examinations It is so essential to limit them to those that really achieve something and to avoid unnecessary examinations which only lull the worker into a false sense of security and incidentally waste everyone s time

Another important form of examination carried out is fitness for work of a man returning from the sick list A recommendation for restrictive work made by the man s own doctor is usually complied with whenever possible if by any chance the department is unable to find the man suitable work there is no alternative but to discharge him these instances are rare and usually only occur when permanent restricted work has been recommended It may be of course that the medical officer in the dockyard knowing as he does the type of work and conditions of work, may not agree that a man

[illegible] use the doctor [illegible] the sick [illegible] fully fit or until [illegible]

The duties of the resident medical officers [illegible] clearly show how important it is for an industrial medical officer to be a real all round doctor

The surgery assistants are nearly always recruited from pensioner sick berth attendants of the navy We thus have a corps of qualified men some of whom are often qualified technicians in some particular branch of medicine We are very fortunate in the dockyard to be able to recruit these ex sick berth attendants and I am certain that the smooth running of the surgery is largely due to their efficient and loyal services

Ministry of National Insurance Certificates

A dull but essential part of the work of the surgery is the handling of Ministry of National Insurance medical certificates of men away from work under the care of their own doctor All medical certificates of industrials have to be sent to the surgery so that details of their sick record may be kept the certificates have then to be sighted by the Expense Accounts Department so that the Admiralty portion of a man's sick pay can be calculated and finally the certificate has to be sent on to the Ministry of National Insurance so that the man can receive his sick pay benefits as soon as possible This work takes up a lot of time and it is essential that there is no delay in handling the certificates During the time of an epidemic of influenza the number of certificates once amounted to 1 821 in a week!

The office side of the surgery is always very busy and the compiling of records filing up of forms and returns letters etc inescapable in these days is an ever increasing burden Considerable thought has been given to the possibility of simplifying the records by some form of card index system but the large numbers employed and the complexity of the dockyard organization makes any simple workable system very difficult

Before we leave the surgery one word about the ambulance service This is very satisfactory and we have a modern type ambulance at the surgery during working hours A relief ambulance is available if there is more than one call and at all times of the day and night outside working hours

Liaison

One very important factor in the smooth working of the medical organization is a close liaison and harmonious relationship with doctors in civil practice and with the hospitals

The vast majority of the workers are the patients of doctors in the neighbourhood and it is part of the ethical code of the industrial medical officer that he should not encroach on their preserves I attach great importance to a close and friendly liaison with the general practitioners and through the courtesy of the local medical committee I have been able to meet a number of them and have had the opportunity of explaining to them the dockyard set up and we have discussed mutual problems There are some 140 general

practitioners in the area There is naturally a good deal of [illegible] with doctors and their patients and we have to ask the [illegible] questions from time to time on the cause of illness and prognosis in turn to work of men out sick This is necessary so that the Admiralty can keep the men on the dockyard books if there is a likelihood of their return to work in a reasonable time and also so that Admiralty sick leave pay can be continued to its limits

I think we can fairly say that we subscribe to and follow the code of ethics for industrial medical officers drawn up by the British Medical Association It is rather as you know has been the subject of criticism on the grounds that it is derogatory that the industrial medical officer should be singled out as requiring a special code Certainly there are duties towards private practitioners which should be strictly observed but I also think there are corresponding duties on the practitioners part also There is one plea to practitioners and consultants that I would make and that is to refrain from issuing certificates stating that a man is fit for his particular work I feel very strongly that it is the province of the industrial medical officer alone to say if a man is fit for his job as he alone knows precisely what that job is and perhaps more important the conditions under which that work is done A practitioner is certainly at liberty to state that a man is fit for work and perhaps in what broad category of work but I do not think he is prepared to state precisely that a man is fit for the particular job he does That is clearly the duty of the industrial medical officer It is embarrassing when a patient made unfit for his work by a dockyard medical officer returns flourishing a certificate from his own doctor who states that he considers him fit When the certificate is signed by a consultant the matter is even more embarrassing as the worker may refer his case to his Union and the status of consultant always carries great weight Now however that the senior medical officer has a specialist status himself he can claim an equal authority in his own specialty I think it would be of great advantage if practitioners would visit the dockyard and see the type and conditions of work in which their patients are employed I have issued a general invitation to this effect

On a similar question we may find ourselves in disagreement with the medical referees of the Ministry of National Insurance as to whether a disease for which a man is claiming compensation is due to his work The referee's decision is of course final but I still feel that the industrial medical officer who knows the man's work and the conditions of work is the best judge especially when he is a specialist in Industrial Health as well

Close liaison with Service and civilian hospitals is also very desirable and the senior medical officer of the dockyard should call on the medical superintendents of all hospitals in the area Liaison with chest clinics which look after most of our chest cases is important and sometimes there are problems to be discussed with the Medical Officer of Health I also think calls should be made on officials of the Ministry of National Insurance and the Disablement Resettlement Officer who may be of great help in settling difficult problems

Within the [illegible] close liaison between the [illegible] course essential not with the head of the department only but with personnel management officers and technical officers within the department. The advice of engineers chemists, the safety officer and other technical officers is often essential and the industrial medical officer should work in association with a team of experts as problems of industrial health are usually composite in their nature and often cannot be solved by the doctor alone. An essential requirement of the status of the senior medical officer in an industrial organization is that he should have direct access to the manager himself in the dockyards according go Naval custom the senior medical officer as head of a department has this direct approach to the Admiral Superintendent.

The senior medical officer also attends board meetings of heads of departments and meetings of the Yard Industrial Whitley Committee when there are medical questions on the agenda or when his advice is required. For advice on medical problems which cannot be solved in the dockyard we have experts on the staff at the R.N. Medical School at Alverstake nearby to whom we can refer and there is the Joint Services and Factory Department Committee on Occupational Health in London from whom advice can be sought through the Medical Director General. The services of the Medical Inspector of Factories for the area are also available and have been sought on several occasions.

Research

With all the wealth of material available in an industrial concern of the size of the dockyards there is surely a wide field of medical research! We have already been associated with problems of pneumoconiosis in foundries and wet sandblasting and the medical department is always associated when dockyard trials are carried out before the introduction of some new process which may involve a hazard to health. The compilation of statistics on injuries would be of value as an indication of how they might be prevented but there are many pitfalls to be avoided if reliable figures are to be obtained. We must not forget medical research in the dockyards abroad where there are many problems in connection with work in hot climates. For example when I was in Singapore recently I had the opportunity of carrying out an investigation into the thermal environment of warships refitting in dry dock. The effective temperature was taken as an index of temperature measurement and the results showed that in many compartments between docks under refitting conditions the effective temperature rose to a degree which was beyond acceptable limits where arduous work could be carried out for any length of time without the likelihood of harm to the worker. Medical research is often long term in its scope and requires adequate time on the job if it is to be done properly.

This completes a very compressed and I fear somewhat breathless account of the medical organization at Portsmouth dockyard which in general outline is I think true of nearly all H.M. dockyards at home. How does it meet the needs of the workman and how does it compare with the medical organization in other large industrial undertakings?

By and large, I think that the facilities now provided by the Admiralty meet the medical needs of the workmen at his work, and in fact in some respects as I have indicated in this paper, I believe the Admiralty have looked ahead and set a standard which may well be followed by other industries. Many of the recommendations of expert committees on the future of Industrial Health have been anticipated. The minimal requirements for the health, safety and welfare of the worker laid down by the Factories Acts are invariably exceeded. The workmen in the dockyards are, I think, well satisfied with the facilities provided and welcome the recent increased interest taken by doctors in their welfare and in the conditions of work in shops and workplaces. We can be sure if they were not satisfied we should soon hear about it—and very properly, through the Whitley Committees. Our relationship with the Whitley Committees and the Unions is in fact a very happy one.

How does our organization compare with that in other large industries? I am not fully qualified to judge, as I have only had the opportunity of visiting a few, but I think it fair to say that within the inevitable financial limits of a Government service, the facilities provided for the dockyard can compare very favourably indeed with those for industries elsewhere, and in the appointment of a senior medical officer qualified in preventive and industrial health the Admiralty is in the vanguard of progress.

Some private firms with plenty of money do provide very elaborate facilities. For example some firms provide dental, chiropody and physiotherapy services at the factory, and some have their own rehabilitation centres. I have heard of electrocardiographic examinations, blood counts, and other examinations being done on a wide scale. These services may be desirable when medical facilities outside the factory are not readily available, but they require large staffs of trained people and cannot often be necessary.

I do not wish to give the impression that I think all is perfect in the dockyard medical organization or in the conditions of work. I am not happy, for example, about the facilities for rehabilitation after injury or illness, as the only centres available at present are a long way away. I think it would be very desirable if there was some scheme by which a man recovering from serious illness or injury could come back to work for restricted hours; this would be very beneficial to the individual and economical. Some special cases have had Admiralty approval for restricted hours of work, but as yet such a scheme is not general. As regards conditions of work in the dockyard there is obviously room for much improvement. Many of the buildings date back to the early part of the eighteenth century, and little can be done to bring them up to modern standards of hygiene without complete rebuilding. I think, however, we should proceed with caution before we recommend wholesale reconstruction on medical grounds. Many craftsmen are probably more content working in some of these old shops in their own small communities than in the impersonal atmosphere of a big modern shop, and if conditions of work are reasonable there is probably little harm to their health. There is a danger that too great a sacrifice may be made to the goddess Hygeia!

[illegible] for considerable improvement in [illegible] ships [illegible] quite heating, lighting, [illegible]

Another matter for [illegible] is the disclosure of medical information. In order that the principle of medical etiquette should be [illegible] and also to protect the Admiralty from possible legal proceedings it [illegible] important that all correspondence which involves the disclosure of the medical reports of a complaint should be treated as confidential. Steps have been taken to ensure that medical documents and correspondence are marked "confidential" and that as far as is possible only authorized persons should have access to the information. But owing to the sordidness of office staffs who have to deal with a large amount of secret and confidential matter it is not always possible to restrict the handling of medical information as much as is desirable.

All these shortcomings are chiefly due to the size of the dockyard or the age of the buildings and the complexity of the organization. As money becomes available improvements can be made and though there is still room for much improvement in conditions of work which will ensure a healthier working environment, I think it is only fair to say that the facilities provided for the worker are good and to say the least compare very favourably with those in other industries.

Summary

In this paper I have attempted to outline the development, the scope and function of a Royal Dockyard and to describe the medical organization which strives to serve an industrial undertaking of this size. I have discussed many of the problems and shown what has been done to meet the needs of the worker and what remains to be done to fulfil the modern conceptions of an Industrial Health Service. The co-operation of the management and the help of technical officers is essential as the doctor can only work as one of a team if the aims of a full Industrial Health Service are to be achieved.

I believe industrial or occupational health (if the term is preferred) is of ever increasing importance in the Services. In the navy not only are there the six Royal Dockyards in this country and those abroad but there are other establishments with important industrial roles such as three large aircraft repair yards employing some three and a half thousand civilian workers. The bigger warships and those ships designed in the last war for the repair and maintenance of ships at sea in what was called the Fleet Train are in fact small floating factories each with their particular problems in occupational health. The need for special training of the Medical Officer is thus very evident and I believe Industrial Health in the navy will become more and more important. We must hope that the educational facilities in the teaching hospitals in the universities and by our own exertions within the Service will expand to meet these pressing needs.

METHYL CHLORIDE POISONING

BY

Surgeon Commander M A RUGG-GUNN, R N

[illegible] occurrence of three personal cases within two years has caused the [illegible] to review this toxic hazard which though not common in civilian life [illegible] within the navy During the seven years period 1948 to 1954 [illegible] there were twelve cases three at Chatham three at Hasler and six [illegible] involving the total loss of 211 working days

Characters and Toxicity

Methyl chloride is a colourless gas having a molecular weight of 50 48 and boiling point of 23 17 It is about 1¾ times as heavy as air and when combined with air in proportions between 8 per cent and 18 per cent by volume it is explosive It is non corrosive under normal conditions but in the presence of moisture hydrochloric acid is formed and this may corrode metals It has a faint but not unpleasant rather sweetish odour is only faintly irritant and does not injure the eyes In industry it is used in the preparation of synthetic rubber and in petroleum refining and as an extractant and agent for methylation and chlorination As far as the navy is concerned practically its only use is in refrigerators where it is in many ways ideal owing to the intense cold it produces on evaporation and the fact that it is non inflammable does not attack metals and is cheap to produce It is occasionally used in some distant reading thermometers though these are usually charged with mercury or ether but the amounts are insufficient to constitute a hazard

Owing to the risk of explosion due to sparks from the motor brushes the ventilating fans are not used in compartments housing a methyl chloride plant unless the machine is a very small one in relation to the compartment and thus these engaged in maintenance and repair are working in a closed atmosphere For the same reason smoking naked lights and halide leak detectors or other flame type indicators are prohibited (A F O 1750/50) leaks being detected by applying soapy water to a suspected source Neglect of this ruling about naked lights has led to disaster on many occasions A recent and dramatic example is recorded by Schulze (1954) in Western Australia where an explosion occurred in the bar of a hotel resulting in the death of seven of the men in the room and the total destruction of the hotel by fire The coroner's inquiry assessed the cause to be the ignition of an explosive mixture of methyl chloride (from a faulty refrigerating system) and air by a match used to light a cigarette

The toxicity of methyl chloride is placed at 100 parts per million by Jacobs

(1949) though Roche and Bouchet (1948) say that for [illegible] placed in a concentration of 100 p.p.m. extended daily [illegible] A.F.O. (7 of 50 states that it is toxic in concentrations [illegible] volume the period of exposure required to overcome [illegible] in the concentration e.g. approximately two hours in [illegible] stratum may prove fatal

The acute and chronic toxicity was worked out by Smith and [illegible] (1947) who exposed ten different species of animals to varying concentrations for six hours daily six days a week. Oddly enough frogs proved amazingly resistant one surviving 231 days at an exposure of 2,000 p.p.m. finally dying of starvation. Younger animals were slightly more resistant. They state that if one assumes that susceptibility of human beings to the lethal effects of methyl chloride is comparable to that of dogs and monkeys then it is evident that daily exposures to concentrations of 500 p.p.m. are extremely dangerous even for a period of two weeks or so. Actually judging on animal experiments there appears to be a direct correlation between the development of the C.N.S. and the toxic effects of methyl chloride and if this is so human beings may be more susceptible.

Then experience on the effect of diet on the animals exposed is of some interest and possibly of practical importance. No increased resistance was noted with excess of nicotinic acid thiamine riboflavine and or calcium pantothenate but an increase in dietary casein from 20 per cent to 30 per cent in rats led to a three fold resistance in the L.F.50 (i.e. the days from beginning exposure to the death of 50 per cent.). Also supplementary cystine and methionine in diets of underfed low casein content led to increases in L.F.50 to 14 times.

When taken by mouth methyl chloride is said to be relatively harmless. In an effort to solve the problem of its metabolism within the body Sperling *et al.* (1950) gave it both as a gas and a solvent intravenously into dogs. Some 80 per cent. disappeared immediately and another 10 per cent within an hour though a very small but constant fraction persisted. No excretion route was detected the lungs only accounted for 1 per cent. and the urine for a minute fraction. They maintain that some extremely efficient mechanism removes it in a very short space of time though a small but constant proportion can be detected for long periods and that the nature of this mechanism is unknown but it may be that there are storage places in the body into which the gas goes and is released very slowly to maintain a constant level.

It is not known for certain how the poisonous effects are produced whether directly by the gas or methanol phosgene formaldehyde formate or other metabolic products but Jones (1942) found no difference in the value of formates excreted in the urine of the normal people compared with that of methyl chloride victims. However derived symptoms are common so it is fair to assume that breakdown products play their part.

The first report of the toxic effects of methyl chloride seems to have been made by Eulenburg (1876). After this there are few further reports until after the First World War when the use of methyl chloride became more

widespread and poisoning more frequent Gualitto (1939) gives an account of an Italian submarine where the air cooling apparatus fitted with a refrigerating plant operated by methyl chloride was deficient The submarine had completed four dives when she had to return to base on account of sickness Altogether 70 per cent of her complement were affected mainly by giddiness dimness of vision persistent vomiting anorexia and outbursts of weeping In the navy the first official notice of the possible toxic effects appears to have been taken in 1939 (A F O 2843/39) and from then until 1940 nine further A F O s appeared drawing attention to toxic effects and laying down rules for safety Cases however continued to appear both in the Merchant Service (Craddock 1950 and Crawford 1954) where the symptoms appear to be well recognized amongst the engineers and in the Royal Navy

In 1940 the navy announced that 1 per cent acrolein a powerful stinking agent would be added to render the escape of gas obvious and given warning (A F O 4596/40) but this was discontinued in 1946 (A F O 6908/46) chiefly because it became absorbed and its effects were lost During the Second World War the only occasion when a number of simultaneous casualties occurred seems to have been in H M S *Stevenstone* which was mined off Holland in 1944 but managed to return to England twenty four hours later The explosion occurred in the forward part of the ship under the stokers mess deck which contained about 30 casualties These were removed as fast as possible and placed on the upper deck The medical officer records that several stokers coming out of the mess deck fell unconscious at the top of the hatch and had obviously been overcome by fumes of some kind When first seen they were deeply unconscious and ashen grey in appearance with very shallow rapid respirations after fifteen minutes the breathing returned to normal and after thirty minutes there was mental confusion disorientation and active resistance to interference After an hour all but 18 men had recovered sufficiently to be able to carry on by themselves 3 of these 18 subsequently becoming violent Headache and vomiting persisted and were followed by a deep sleep after twenty four hours there were no ill effects The medical officer considered that the general picture was similar to any case of surgical anaesthesia carried to a deep level and his conclusion was that they have been poisoned by the fumes of methyl chloride from the refrigerating system The Commanding Officer of the *Stevenstone* in his official report states Undoubtedly some of the deaths occurred through men becoming unconscious on the mess deck through the escape of methyl chloride gas from the ship s damaged refrigerator plant One or two breaths were probably sufficient to render these men unconscious after which they were drowned by the rush of sea water All who managed to get to the top of the hatch did so as they were about to be overcome by the gas A few others were rescued while unconscious just before they would have been drowned by the rising water The ship later entered dry dock where examination of the refrigeration compartment showed that the bulkhead was split and the pipes containing methyl chloride were fractured

Pathology

The pathological [illegible] specific [illegible] usually showing cerebral oedema minute hemorrhages in the brain liver kidneys and heart and degenerative changes in the liver and kidneys mostly congestion and fatty degeneration The pathology in animals was investigated in detail by Dunn and Smith (1947) who exposed seven species of animals to various concentrations involving the use of several hundred animals mostly mice rats and guinea pigs but also dogs cats monkeys and goats

Their findings may be briefly summarized as follows

(1) A variable degree of necrosis of convoluted tubules in the kidneys of mice and rats

(2) Renal changes and occasional haemoglobinuria in mice and dogs

(3) Frequent but mild fatty changes in the liver and kidneys in smaller animals.

(4) Pulmonary oedema from inhalation.

In man in high concentrations it acts as an anaesthetic with recovery if stopped in time and in lower concentrations as a nerve poison with reversible changes and recovery

Many authors have commented on the liver changes and occasional jaundice (Kegel *et al.* 1929 and Weinstein 1937) and Jones (1942) reported an abnormal levulose tolerance but which later returned to normal It seems that if a person is subjected to small and subhelmical dosage over some length of time cirrhosis may set in Wood (1951) gives an interesting example of this the patient aged 43 had been a refrigerator engineer for ten years and had frequently been exposed to fumes but had had no symptoms of poisoning Eighteen months before he had a mild painless jaundice with dark urine and pale fæces and was admitted to hospital with hæmatemesis He subsequently died the hæmorrhage was from an ulcer on the posterior wall of the stomach and the liver was grossly cirrhotic He had taken no alcohol at all for five years and very little before that and the author gives his reasons for considering the cirrhosis due to small, frequent doses of methyl chloride

Symptomatology

In strong concentrations, methyl chloride acts as an anaesthetic as in H M S *Stevenstone* cited above Also being heavier than air it tends to settle on the floor of the compartment and anyone bending and looking for a leak may be exposed to high concentrations MacLeod's experiences in H M S *Eae* in 1942, when he had to rescue the chief engineer and the chief stoker from the cold room are of interest in this respect The two individuals had been working to locate a leak and there was no apparent noticeable amount of gas in the cold room While they were working they had both gone on their knees and had suddenly received a full breath of the gas Both were literally knocked out cold and when the medical officer went in with a respirator two minutes later, they were completely unconscious They recovered in the same manner as from an inhalation anaesthetic and had amnesia for events

immediately [illegible] in the incident and a headache for two or three days afterwards but no vomiting.

These acute cases are not common and recovery is complete provided they are removed from the gas in time. In practice the majority of cases might be divided as subacute and with the exception all the present series seem to fall within that category. True chronic cases are very rare though the case of hepatic cirrhosis cited above may come under that heading.

In the 12 patients under review the main symptoms and signs may be arranged as follows: Giddiness 9, nausea and vomiting 8, drowsiness and mental dullness 8, headache 6, weakness 4, slurred speech 4, hiccough 3, diarrhoea [illegible], and difficulty with convergence 1 of each, tremor 1, pallor 3, [illegible] 1, [illegible] alone 3, ptosis 2.

In one measure most of these symptoms overlap and the percentage [illegible] of them might still have been higher if they had been specially [illegible] for.

Hanson *et al.* (1943) give an account of 12 cases of poisoning in [illegible] manufacturing plant and tabulate their main symptoms as follows: Dizziness, weakness and blurred vision 11, muscular incoordination and drowsiness 11, gastrointestinal—anorexia, nausea—diarrhoea and vomiting 12, diarrhoea and vomiting only 3, sleep disturbances (nightmares and restlessness) often late 11, mental confusion 6, hiccough 5.

They also remark that slurred speech was very common, hiccough may persist for several days and that slight fever occurred in 8 and tachycardia of 100 in 12. Many observers have drawn attention to the fact that the men appear drunk, the mental confusion, slurred speech, weakness and incoordination making the simile a close one, the vomiting and hiccoughs completing the picture. The present series shows a rather higher percentage of vomiting than might be expected, perhaps due to the fact that they had a shorter exposure at a higher concentration than the industrial cases.

The loss of facial tone in 3 patients giving them a rather haggard expression and ptosis in 2 is worthy of mention.

If the mental drowsiness and confusion are disregarded, mental symptoms were not noticeable in this series, though they can occur and may be striking. Cimletta (1939) records that the Italians give way to periodic bouts of weeping for no reason at all; this may be a southern characteristic in a manifestation of mass hysteria as it is not a commonly recorded phenomenon. Two of the present series were, by contrast, somewhat euphoric in the stage of recovery and one had vivid dreams. Craddock (1950) gives an account of the hallucinations in his patient in whom mental symptoms were a marked feature of the illness; the patient was normal by day but deluded at night when he had the same recurrent nightmare in which he felt that he had been abducted in the night by a man who passed through his body, died in the process and came out through his toes. The patient dreaded the night and was convinced of the reality of his experiences.

Delayed effects, when they occur, usually come on about the fourth day when there may be a rise in fever and a recrudescence of symptoms. They may, however, come on at any time up to three weeks.

The [illegible] series the urine was [illegible] normal [illegible] 5 of which were normal and one had a [illegible] count of [illegible] The blood urea done in 2 cases was normal [illegible] and 4 mgms per [illegible] the other. The thymol turbidity done in [illegible] was normal and [illegible] cholesterol. Van den Bergh reaction and potassium [illegible] done in each case were likewise normal.

The following case histories are condensed as far as possible.

Case I. G. [illegible] aged 32. [illegible] [illegible]

Case II. A. D. [illegible] aged 40. [illegible]

Case III. A. M. [illegible] aged 38. [illegible]

Case IV. [illegible] [illegible]

Case [illegible] — [illegible] This patient was by far the [illegible] He had [illegible] working with a faulty refrigerator [illegible] and had frequently noticed the smell [illegible] two [illegible] times he had been peculiar [illegible] weeks before [illegible]

On 30 5 51 [illegible] Leith Hospital in [illegible] complaining [illegible]

On 31 5 51 [illegible] in the Queen Mary's Hospital [illegible] further his [illegible] with an [illegible] of [illegible]

Apart from drowsiness the only signs were a coarse rhythmic tremor of [illegible] especially the right and gross incoordination of the movements

The patient was followed up until 19th November nearly six months [illegible] but when he still had [illegible] tremor of the hands especially [illegible] emotional strain

Case VII — A R aged 38 This patient was admitted on 8 11 52 for [illegible] He had been engaged on filling methyl chloride containers and went sick complaining headache vertigo nausea and three loose motions Recovery was rapid and uneventful

Case VIII — F B aged 20 Admitted 27 3 52 for four days He had been working on a leaky refrigerator and complained of dizziness nausea and lethargy all of which passed off in twenty four hours

Case VIII — G J aged 37 There had been an explosion in this patient's ship and he had been exposed to escaping methyl chloride for about one hour He was wearing a gas mask but he thinks it leaked At about 3 30 p m on 28 7 52 he started to cough this lasted about half an hour The patient then started to vomit and felt dizzy and unwell with considerable headache He was admitted to hospital there were no abnormal signs except slight bronchospasm Recovery was uneventful

It seems reasonably certain that the patient was exposed to a mixture of noxious fumes which caused his bronchitic symptoms

Case IX — I V aged 32 The patient had been working in the ship's refrigerator and in the evening became dizzy and then vomited off and on all night He was admitted to hospital the next day (17 1 50) where he was found to be pale very sleepy nauseated and with slurred incoherent speech His breath is recorded as smelling of seaweed (this persisted for two days)

The next morning he was hazy and retarded but became euphoric in the afternoon and asked to go out Subsequent recovery was uneventful

Case X — R D aged 36 This patient had been working in a refrigerator compartment for half an hour and came out about 3 30 p m At 4 p m he had tea but felt sick and vomited it vomiting then continued until late that evening He was admitted to hospital 17 1 51 feeling dizzy sleepy and nauseated There were no abnormal signs beyond slight tremor Recovery was uneventful

Case XI — B W aged 32 The patient had been filling refrigerators and was admitted to hospital 27 3 52 complaining of giddiness headache nausea and vomiting which persisted for some hours Beyond pallor there were no abnormal signs and recovery was uneventful

Diagnosis

This may be difficult without prior knowledge of exposure, as there is nothing specific in the syndrome of symptoms The smell of the patient's breath may be the most important diagnostic feature it is seldom absent in a fresh case and has been variously described as slightly sweet musty or (as in one of the above cases) like seaweed but it is unlike alcohol which is usually the other diagnosis to be considered

A combination of uncoordination headache slurred speech vomiting and hiccough are suggestive symptoms and pallor, facial weakness ptosis and tremor are useful signs

The pupils are often dilated and sluggish in their reaction but in no way differ from many other poisonings

There is no definitive test for methyl chloride and the diagnosis cannot be made on laboratory tests (Smith 1947)

The blood picture is usually normal or may show a primary anaemia with slight leucocytosis

The urine is usually normal acetonuria albuminuria and glycosuria have all been recorded

The diagnosis therefore depends on the history of exposure and the possibility of methyl chloride poisoning in their presenting with the above symptoms

TREATMENT

Prevention Precautionary measures to be taken have been laid down in A F O 1750/50 and need not be repeated It seems possible that methyl chloride will be replaced by Freon 12 (American trade name it is manufactured in Britain under the trade name of Arctos 6) which is neither toxic nor inflammable and which is already used in submarines and plants fitted near magazines Ammonia and sulphur dioxide which are sometimes used in small domestic plants have a pungent odour which rapidly reveals their presence.

First Aid Treatment The patient must obviously be removed from the contaminated area If work has to be undertaken in an atmosphere known to be contaminated the time in it should be reduced to a minimum and the maximum interval of time should be allowed between each period of work If the slightest complaint is made attributable to the effects of methyl chloride the person should be barred from the work for a minimum of two weeks

It seems reasonable to spare the affected subject all unnecessary exertion In other words he should be rested as much as possible If the person is unconscious the case is essentially the same as an anaesthetized person with due consideration to warmth and a clear airway Artificial respiration and oxygen may be required

Specific Treatment There is no agent known to counteract the effect of the drug In view of the occasional presence of ketone bodies in the urine treatment with sodium bicarbonate is frequently advocated It would be contraindicated however if vomiting is prolonged as is often the case Glucose drinks may be given by mouth the glycogen content of the liver is thereby increased and also nervous tissue is dependant on glucose for its metabolism

Experimentally as cited above ascorbic acid thiamine and nicotinic acid were ineffective in raising the resistance of animals to the poisons however, if nervous or mental symptoms are present there would seem to be a good case for giving nicotinic acid and thiamine as for delirium tremens as

these are the catalysts whereby nervous tissue utilizes its glucose In the case of an unconscious patient they can be given by intravenous drip in a glucose saline mixture

Experimental work has shown the unique property of casein in raising animals resistance It is debatable whether it would have any therapeutic effect on the average case and it does not appear to have been tried but a good case could be made out for giving a high milk and cheese diet during the stage of recovery Similarly the use of methionine given intravenously to the more ill patients would seem worth while one of my personal patients was so treated though it was impossible to say whether it had any effect on the course of the illness

Convalescence Several writers have stressed the onset of delayed symptoms though they appear to have occurred more frequently under experimental conditions than in clinical practice No case occurred in the present series According to Mottai (1954) delayed symptoms and even death can occur two or three weeks after apparent recovery Probably the average mild case requires no more than a few days rest in hospital but if the dosage has been large and symptoms severe it is certainly advisable to retain the patient in hospital for three weeks Apart from the possibility of delayed symptoms recovery is usually rapid and complete within ten days or so though in one case mentioned above (Case V) tremor was still apparent after six months

SUMMARY

After a literature review 100 cases of methyl chloride poisoning have been recorded in the literature over half of them in America 12 additional cases are reported (11 patients 2 being admitted twice) all admitted to the Royal Naval hospitals at Chatham Haslar and Plymouth within the past seven years The appropriate experimental work and pathology of the condition is reviewed and the main facts of the 12 cases are summarized Possible lines of treatment are discussed

I am grateful to Mr R C Frederick *M B E* Surgeon Commander J M Holford *O B E* R N Surgeon Commander G H G Southwell Sander R N and Surgeon Commander N S Hepburn R N for assistance given and to the Medical Registrar of the Seaman s Hospital Greenwich, for his notes on Case V

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THE TREATMENT OF ASPHYXIA AND A SUGGESTION FOR AN ADAPTATION OF THE NOVOX APPARATUS

by

Surgeon Lieutenant J. D. K. BURTON, R.N.V.R.

While acting temporarily as a factory doctor the author has been considering the treatment of asphyxial emergencies, particularly those occurring in industrial practice. It is felt that the perfect method is not yet available, recent advances in the treatment of bulbar polio may assist us to find this. The methods commonly in use, and also those which it is considered should be more widely employed, are described.

Asphyxia is not confined to the factory, as recent articles on carbon monoxide poisoning in the home have shown, and the general principles are the same everywhere. [1] In asphyxia the body is exposed to the twin insults of oxygen lack and carbon dioxide poisoning, and several factors are involved in most cases.

Reduction in oxygen available for metabolism can be due to:

A. Low percentage of alveolar oxygen. (Anoxic anoxia.)
B. Diminished blood flow. (Stagnant anoxia.)
C. Reduced oxygen carrying power of blood. (Anæmic anoxia.)
D. Prevention of oxygen uptake by the tissues. (Histotoxic anoxia.)

The main subject of this article is anoxic anoxia which may be due to a low percentage of oxygen in the inhaled air or to poor pulmonary ventilation.

Stagnant and histotoxic anoxia, as exemplified by severe shock and cyanide poisoning, are outside the scope of this article.

Anæmic anoxia is produced by carbon monoxide poisoning, with replacement of hæmoglobin by carboxy-hæmoglobin. This produces anoxia of the respiratory centres, a reduced tidal volume, and therefore secondary anoxic anoxia.

Poor ventilation may follow damage to the nervous system and be

(1) Central—as in head injuries or narcotic poisoning e.g. Trilene in degreasing

(2) Spinal—in high spinal injuries or poliomyelitis

(3) Peripheral—from nerve gases and insecticidal sprays or it may be caused by obstruction in any of the air passages

In all these cases the available alveolar oxygen must be increased as quickly as possible. Oxygen lack not only stops the machine but wrecks the machinery (Haldane). This will require artificial respiration if breathing is inadequate and if possible the addition of oxygen.

Pure oxygen has no ill effect when breathed under normal pressure for periods of a few hours [2]. (The dangers of its use in cor pulmonale or emphysema, and unpleasant side effects due to rapid absorption from blocked sinuses and ears need not be considered in an emergency.)

Massive collapse of the lung distal to a bronchus partially blocked by inhaled mucus or vomit may follow cessation of therapy as pure oxygen is rapidly and completely absorbed in the alveoli distal to the obstruction. This can lead to a seemingly inexplicable further embarrassment of respiration after apparent recovery. A gradual reduction in the oxygen percentage inhaled will prevent this.

To provide adequate oxygenation of the blood a means must be used that is safe and immediately available. If respiration has ceased one of the effective forms of artificial respiration such as the Holger Nielsen is indicated. Artificial respiration may be supplemented by oxygen administration thus raising the alveolar oxygen further. Care must be taken however that the tidal volume is sufficient to eliminate the carbon dioxide. When spontaneous respiration returns it may need to be assisted for an excessive rise in the blood carbon dioxide level produces an anæsthetic effect causing further respiratory depression. The use of O_2/CO_2 mixtures increases this risk in circumstances when the respiratory centre is unable to respond to the normal stimulating effect of carbon dioxide [3]. The possible ill effects of over ventilation are negligible under the conditions considered here.

The available methods for providing oxygen and adequate pulmonary ventilation are

Artificial respiration—with oxygen a mask and breathing bag (as in B.L.B. mask)

Artificial respiration and the Novox apparatus

Oxford inflator

Lucas bellows (with oxygen) [4]

Mackintosh bellows (with oxygen) [5]

The first two have the disadvantage that artificial respiration must be performed continuously a strenuous job and that the apparatus is useful only so long as a supply of oxygen is available. Also the patient cannot be moved conveniently until respiration has returned.

The rebreathing bag method (Fig. 1) requires some form of oxygen flow

meter or the patient may be rebreathing to a considerable extent. To keep a steady flow of over 5 litres/min as the pressure in the cylinder falls a reducing valve is necessary or continual adjustments will have to be made. A 60 gall. cylinder will last an hour at a rate of 6 litres/min.

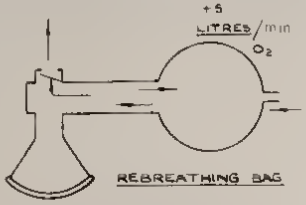

Fig. 1

The danger of rebreathing might be eliminated by absorbing the carbon dioxide with soda lime or by using a two valve system as shown (Fig. 2). The first method would waste no oxygen but require expert attention and handling. It could not be used after trilene poisoning as the trilene excreted by the lungs would react with the soda lime to give the toxic products phosgene and dichloracetylene. Less than one tenth of the amount of oxygen would be required.

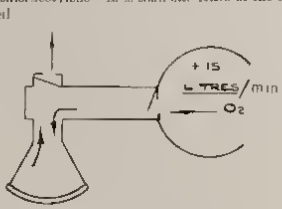

Fig. 2

A two valve system requires a considerable volume of oxygen or its dilution with air as there is no rebreathing [6]. The Novox is used in this manner at present. If the lungs are inflated by manual pressure on the anaesthetic bag as an anaesthetist does the outlet valve must be loaded to a degree. A layman might produce a dangerously high pressure in the lungs.

The Novox requires certain force to operate the oxygen demand valve. This is hardly attained by the passive inspiration of artificial respiration. The use with the by pass valve is wasteful as stated above and repeated

adjustment of the flow is required as the cylinder pressure falls. The cylinder usually lasts twenty minutes.

The Oxford inflator provides a rather high pressure of oxygen from a reducing valve by moving a lever on the mask. This inflates the lungs and by turning the lever the flow of oxygen is stopped and an expiratory hole opened allowing the lungs to collapse. If used by a layman the lungs can be exposed to a very high oxygen pressure (45 mm Hg.) when they are fully expanded. Any pressure above 10 mm Hg. may cause rupture of the alveoli and surgical emphysema or pneumothorax. When the oxygen supply is exhausted these machines are of no further use.

Both the Lucas and Macintosh bellows can be used with or without oxygen supplement. Both can be kept in easily available places near possible scenes of an emergency.

The Lucas bellows (Fig. 3) is the more robust and works on the same principle as a rebreathing bag with a loaded expiratory valve. It is difficult to use with the patient prone as it is necessary to prevent obstruction of the airway by the tongue and the inhalation of mucus and perhaps blood. An angle piece fitted between the bellows and mask would make it easier to use but the apparatus is not safe in inexpert hands unless modified.

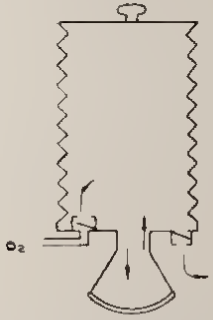

Fig. 3. Lucas bellows.

In Macintosh's model (Fig. 4) the bellows are [illegible] from the mask and by lifting the handle of the bellows an expiratory vent is automatically opened [7]. The principle of the mechanism is shown in the diagrams. It can

also be used without oxygen and provides excellent respiration for hours with ease. It can be used by an almost untrained person. There is no rebreathing.

The disadvantage of these machines is that if the mask is not held on correctly the patient may get very little tidal excursion. However, it should be possible for the operator to see the chest movements in response to his pumping and to appreciate their degree to a much greater extent than when performing manual artificial respiration. It seems probable that there should be less danger of underventilation from this cause than from poor technique in a manual method.

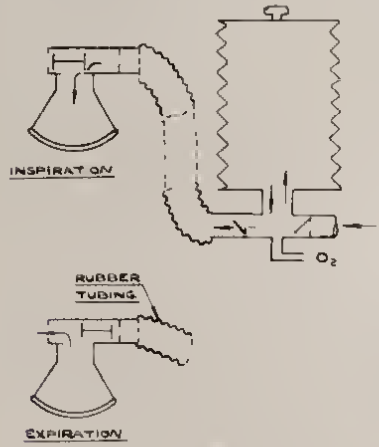

FIG. 4. Mount Sinai and Mushin type bellows.

In these two forms of apparatus the oxygen can be supplied either by a constant flow supplementing the air or through a self-demand valve as used in the Novox and in the economizer in aircraft. The suction of the expanding bellows will work the valve.

As the Novox apparatus is in general use in the service, a bellows attachment could be fitted in place of the present corrugated tube and face mask. The bellows type would fit more easily into the existing case and could be combined with an anti-stun valve of similar principle to that of Mushin.

A simple [illegible] form of bellows has been described by J. Kreiselmaier [illegible] and a [illegible] account given of their use [8]. This would make the method fully effective in delivering oxygen and the by-pass valve would [illegible] time in use. It would also dispense with the need for a manual method of artificial respiration when the apparatus is available at the site of the emergency. The patient could then be transferred to hospital, or a place that is more convenient, with the apparatus in use on the stretcher.

There is no suggestion that the Holger Nielsen or other effective method of artificial respiration could be replaced for immediate use unless the bellows were at once available.

If the apparatus were issued with the regular Novox the difficulty of treating phlebotychitis at sea would be minimized. Positive pressure respiration can be supplied by relays of assistants until the case is transferred to a regular hospital.

In reviewing the various forms of apparatus no criticism is intended of their effectiveness for their intended purpose. Only the possibility of their use for treating asphyxial emergencies has been considered.

An apparatus that fulfils the requirements outlined above has been made in the R.N. Aircraft Yard, Fleetlands. It can be used either on its own or with an oxygen apparatus. Several safety factors have been incorporated and at present it is adapted for use with the Novox. It could be used equally well with any oxygen supply. This apparatus is only meant to be a suggestion for the treatment of asphyxia. The author is certain that it will be improved by further suggestions and hopes that this article will produce them.

Summary

The problem of asphyxia and anoxia has been reviewed. Several methods of resuscitation have been described and their advantages and disadvantages noted.

It is suggested that some form of bellows be provided for use with the existing Novox machine or a lighter apparatus of similar principle.

Two possible types of bellows have been mentioned and a combination of the two suggested. The advantages of this would be:

(1) Artificial respiration can be given to a patient during transport and kept up easily for long periods.
(2) No new form of oxygen supply is necessary.
(3) Little training is required in its use.
(4) The problem of phlebotychitis at sea is made easier if the apparatus is in general distribution.
(5) The apparatus is robust, inexpensive, easy to maintain and if used without oxygen very easily portable.

Further details of the apparatus will gladly be given to anybody interested.

I wish to record my appreciation of the co-operation of Dr. R. A. Murrell in preparing this article. Commander (L) P. L. V. Slater for his technical

[illegible] ing the [illegible] and the [illegible] and [illegible] of the management and [illegible] R N A A [illegible] The [illegible] Nuffield department of anæsthetics have provided me with [illegible] their Oxford inflating bellows These are ideal in all respects except that they will not fit into the present Novox case

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Clinical Notes and Cases

A CASE OF PROLONGED APNŒA FOLLOWING CEREBRAL LACERATION

BY

Surgeon Commander H. L. CLEAVE, R.N.

AND

Surgeon Lieutenant T. H. CHRISTIE, R.N.V.R.

[illegible] given an intravenous infusion of [illegible] in [illegible] and the next pain more slowly.

On [illegible] condition remained substantially [illegible] about 100 [illegible] and tension. He [illegible] every four hours. [illegible] a bone flap. [illegible] impression [illegible] pressure [illegible] operation to start. [illegible] and the heart stopped.

[illegible]

Anesthetist's Report. [illegible]

[illegible]

Discussion

The [illegible] recognized [illegible] the diagnosis [illegible]

The general [illegible] tion of [illegible] respiratory [illegible] breathing [illegible]

[illegible] equipment [illegible] Previous return engorgement of the [illegible] with aggravation [illegible] bleeding, especially if it is venous.

[illegible] caused by partial obstruction inhalation of secretions etc. will al[illegible] lead to primary death of brain tissue as well as coronal hypertension [illegible] of cerebral vessels. It is desirable if cerebral hiscretion has [illegible] thus essential that adequate respiratory exchange should be [illegible] as possible.

[illegible] plasma CO_2 level is a fairly constant finding following experimental [illegible] caused CO_2 level in arterial blood is a most powerful dilator [illegible] It follows therefore that adequate ventilation is essential. [illegible] assisted respiration in cases where respiratory depression [illegible] CO_2 level is present are desirable.

[illegible] instantaneous rise of CO_2 level by the rapid heating of the [illegible] Recently another case of cerebral injury without apparent [illegible] in which artificial raised CO_2 level in a similar way [illegible] CO_2 estimations were made in these cases.

Summary

A [illegible] case of apnœa following cerebral hæmorrhage and treated by [illegible] respiration is presented.

The place of tracheotomy or tracheal intubation is mentioned with special reference to the [illegible] of raised intracranial pressure anæmia and raised CO_2 level.

HEMI-FACIAL SPASM

BY

Surgeon Commander D. P. GURD, R.N.

The patient a very healthy looking man of 47 years of age reported to the [illegible] department of the Ophthalmic Hospital of St. John complaining [illegible] sometimes he found it impossible to keep his eyes open in the sunshine. [illegible] very common complaint in the Middle East where inflammatory [illegible] of the eyes is rife and the glare of the sun very trying. The patient [illegible] referred to the usual examination of the external eyes and was directed [illegible] dark room for refraction and fundus examination. While waiting his [illegible] was noticed to have been attacked by very severe left sided hemi facial [illegible] He explained that these attacks were what he came to ask advice [illegible] and that they occurred six to nine times daily. A photographer was [illegible] and while he waited the patient obliged with another spasmodic [illegible] The spasm lasted for about 20 seconds. It began with a twitching [illegible] the eyelids and muscles of expression on the left side of the face which [illegible] in an intense spasm affecting the orbicularis to a marked degree.

The condition is fully described by Duke Elder who recommends injection [illegible] alcohol round the branch of the facial nerve which supplies the orbicularis

This is effected by [illegible] needle at the junction of [illegible] cutting, the lowest [illegible] external auditory meatus with [illegible] marking the posterior [illegible] and behind the post[illegible] of the canals A few minims of [illegible] first injected and after a few minutes a similar amount of 80 per cent [illegible] is slowly introduced This measure was carried out and was followed by a weakness of the facial musculature which became maximal some two hours later when the patient experienced difficulty in drinking with comfort Two days later he reported stating that he had had three attacks since the injection but that they were of a minor nature and did not distress him He has not come back since then

This condition is described because it is not very commonly encountered in practice but is of some significance as it constitutes an obvious disability which may be socially distressing and economically dangerous when it affects drivers of vehicles or those who carry out fine precision work in which continuity of attention is essential The history given by the patient was not presented in a way which would have led to the diagnosis had he not obliged with an attack while under observation

My thanks are due to Sir Stewart Duke Elder K C V O Hospitaller of the Order of St John, for permission to publish this account

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SPONTANEOUS MEDIASTINAL EMPHYSEMA

BY

Surgeon Lieutenant-Commander J. MacF. CLIFF, R.N.

Spontaneous mediastinal emphysema has long been recognized as an occasional cause of pain in the chest, but the significance of a peculiar crackling or crackling sound heard over the precordium in this condition is not always appreciated. In recent months the following cases have been seen in naval hospitals, in each of them this extraordinary sound was heard.

[illegible] Aged 27. On 11.6.53 this patient was taken [illegible] with pain which was persistent and followed by dyspnoea and [illegible]. There was diffuse pain over the left chest and [illegible] the pain [illegible] during the following month the left lung [illegible] 18.9.53 he complained of a crackling noise which he had heard [illegible] this noise was also heard occasionally in the [illegible]. There was no dysphonia. On 11.8.53 the lung bases [illegible] A review of the chest films revealed air in the mediastinum [illegible] 11.8.53, although there were no abnormal shadows [illegible].

[illegible] Aged 42. While in hospital [illegible] 8.9.53 this patient experienced [illegible] in the left hypochondrium [illegible] 18.9.53 [illegible] 12.2.53 [illegible].

[illegible] Aged 22. On 11.4.53 this rating complained of a persistent pain [illegible] occasional clicking sensation in the chest. Examination [illegible] 1.5.53 the clicking noise was audible with a stethoscope [illegible] the pain in the chest was [illegible] disappeared on 24.4.53 and [illegible] 4.5.53 [illegible]. On 3.6.53 there was [illegible] and on 4.6.53 mediastinal air [illegible] lasted [illegible] lasting weeks clicking, carrying sounds [illegible] and [illegible] until 17.5.53. A chest film on 8.7.53 was normal.

Comment

[illegible] first recognized this condition when he described grating [illegible] as a diagnostic sign of subpleural or interlobar [illegible] it was identified by the presence of subcutaneous [illegible] after chest injury or forcible distension of the lungs [illegible] a remarkable case of pneumothorax in which a [illegible] about twenty feet was found to have subcutaneous emphysema of the left side of the chest with a left pneumothorax but no evidence of a rib fracture. The following day a noise something between a click and the noise made by a bursting bubble was audible all over the room being synchronous with cardiac systole and varying with posture. The noise was audible at the bedside for four days and Morris thought that it was

du[illegible] bubbles of air lying between the pericardial and parietal layers of pleura.

During the First World War Rees and Hughes (1918) noted a loud tapping sound over the heart in 9 cases of gunshot wounds of the left chest. The sound varying in intensity with respiration and heard at some distance from the chest in 4 of the cases. Smith (1918) suggested that the sound might be due to the heart striking air in the interstitial tissues of the lung and introduced the term pericardial knock. In 1928 Lister recording what he considered to be the first case in civil practice gave details of a manifest 31 year old woman complained of pain in the left second intercostal space and a loud tapping sound in the chest on inspiration this sound was clearly heard from five feet varying with position and respiration and a chest film showed a partial left pneumothorax with small calcified foci surrounding one from both hila and a little fluid in the left costophrenic angle.

In more recent years greater interest has been taken in this condition and not only have more cases been reported but animal experiments have been carried out to determine how air reaches the mediastinum. Hamman (1937) described 6 cases (all males aged 16 to 24 years) and he observed a historical precordial or retrosternal pain often a sense of pressure or explosion beneath the sternum sometimes severe and radiating to the back neck or shoulders but rarely to the arms which was not accompanied by constitutional disturbance. The striking clinical findings were diminished or absent cardiac dullness a peculiar sound over the heart which was often heard by the patient and from the end of the bed synchronous in timing and sometimes disappeared with variation in posture subcutaneous emphysema sometimes appeared in the suprasternal notch or above both clavicles to indicate the diagnosis. The chest film was diagnostic when it demonstrated air in the mediastinum either in the anterior mediastinum in the lateral view along the lateral walls if the mediastinum in the postero anterior view or as streaks along the blood vessels in the lung. A small amount of air in the mediastinum might give rise to no symptoms or merely a little localized pain. Severe symptoms might suggest coronary infarction or pericarditis but for the absence of constitutional upset the diminished cardiac dullness the possible presence of subcutaneous emphysema or of air in the mediastinum on the chest films and the unmistakable noise.

Macklin (1939) demonstrated in animal experiments that hyperinflation of the lungs of cats with air blown through a catheter ruptured alveoli and bronchioles causing pulmonary interstitial emphysema followed by mediastinal emphysema and subcutaneous emphysema in the neck a pneumothorax often occurred and occasionally an embolism was noted. Sections of lungs inflated in this way showed no air in the bronchial sheaths but the branches of the pulmonary artery and vein were surrounded by an air space and the lumina of these vessels were almost obliterated with consequent obstruction to the pulmonary bloodflow; air in the mediastinum contributed to circulatory embarrassment.

[illegible] occur as [illegible] in pulmonary interstitial emphysema and mediastinal emphysema the air either bursting through the thin mediastinal pleura or tracking towards the visceral pleura to cause a subpleural bleb which ruptures McGuire and Bean (1939) described two cases of spontaneous interstitial emphysema of the lung in females aged 17 and 39 one being associated with a small left pneumothorax Kirshner (1939) reported on another female aged 17 with subcutaneous emphysema above both clavicles and a small left pneumothorax Miller (1944) added 4 more cases in males aged 21 23 (2) and 28 a left pneumothorax occurring in 2 of them A left pneumothorax is therefore a surprisingly frequent complication of this condition although Hamman (1939) who found it to be present in two of his 7 cases thought that a larger series would show no predilection for the left side Physiologically such a pneumothorax may be valuable since it collapses the lung and therefore stops air leaking into the vascular sheaths

As its name implies spontaneous mediastinal emphysema is seen most often as a primary condition but it can occur whenever there is forced expiration against a closed glottis and therefore it has been observed in pertussis asthma during labour and in severe crying or straining at stool it is also seen during the induction of an artificial pneumothorax

Treatment is symptomatic the air being absorbed rapidly from the mediastinum once the point of entry has closed Extreme pressure in the mediastinum with consequent circulatory embarrassment might be an indication for multiple incisions to allow the air to escape or an artificial pneumothorax could be induced in order to stop further air entering the interstitial tissues of the lung Waring (1944) advises the use of a high pressure chamber to reduce the volume of the air in the mediastinum

Summary

Three cases of spontaneous mediastinal emphysema are described the ætiology pathology and treatment of this condition are discussed

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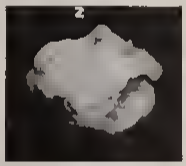
A CASE OF COMPOSITE ODONTOME

BY

Surgeon Commander (D) P. S. TURNER, R.N.

A COMPOSITE odontome may be described as an aberration of the tooth germ resulting in a tumour composed of a calcified mass of tooth tissue—enamel, cement, dentine and pulp may all be present. They grow very slowly and seldom give rise to any symptoms unless due to size or infection.

[illegible] Dg[illegible]



[illegible] ation

[illegible] Reported [illegible]

A CASE OF MULTIPLE CYSTS OF MANDIBLE

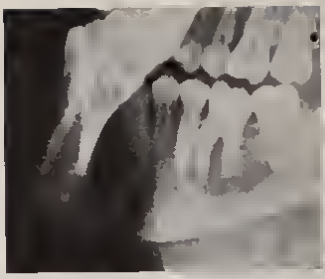
BY

Surgeon Commander (D) P. S. TURNER, R.N.

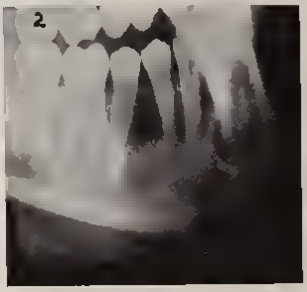
MULTIPLE cysts of the jaw are uncommon and have certain differences from the normal dental cyst. While a dental cyst is usually associated with irritation and infection from a dead tooth, uncrupted tooth, buried roots, etc., multiple cysts of the jaw are probably developmental in origin.

Ordinary Seaman, aged 17.—Reported with slight pain in the lower right jaw. All teeth appeared to be alive and in good order with $\frac{8}{8}$ uncrupted. Occlusion normal.

History.—Nothing of interest except mother has tuberculosis of left lung.



1 [illegible] R [illegible] cysts $\overline{43}$| and $\overline{76}$|



[illegible] $\overline{3}$ [illegible] |45

X ray examination revealed cystic areas in the mandible in four separate places $\overline{76}$| $4\overline{3}$ $\overline{23}$ and |6 regions X rays of skull and long bones revealed no abnormality

It was decided to operate in stages owing to the amount of bone already lost

1st Operation (Surgeon Commander (D) W E L Brigham)—Under G A and penicillin cover Cyst in 76| region removed entire also $\overline{765}$ teeth

contents the cyst [illegible] with a gold like material [illegible] cauterized and packed with [illegible] varnish [illegible] eventual

2nd Operation (Three months later Surgeon Commander (D) P S [illegible] —Cysts in $\overline{45|}$ and $\overline{23}$ areas removed entire together with [illegible] teeth Cavity cauterized and packed for one week with gauze and [illegible] The same cheesy white contents found.

3rd Operation (Two months later Surgeon Commander (D) P S Thomas) Cyst in $\overline{|5}$ area removed entire attached to $\overline{1}$ $\overline{|46}$ also removed [illegible] with tooth attached was sent to Professor M Rushton M D F D S of [illegible] Hospital for examination and section The section was returned with the following report

"$\overline{|5}$ is a normal tooth with healthy pulp Attached to the side of the root and separated from it by healthy periodontal membrane is a cyst lined with a thin layer of stratified squamous epithelium about 5 cells deep The epithelium is keratinizing and has produced numerous concentric laminæ of keratin which are to be found in the cyst cavity together with other disintegrating cellular material forming the cheesy content There are few signs of inflammation This degree of keratinization is rather unusual in dental cysts

One could entertain the idea that this was a developmental anomaly and not dental cysts of the usual sort"

Remarks

(*a*) At each operation the cavities were cauterized buccally but the lingual ridge retained The final result gave an excellent denture ridge

(*b*) One would have expected unerupted $\overline{8|8}$ to be involved but so far they appear to be normal Teeth present now are $\overline{8 \quad 4 \quad |}$ $\overline{\quad 8}$

(*c*) The cheesy white sago like contents was apparently due to a high degree of keratin formation and subsequent degeneration

(*d*) It was probably unnecessary to operate in stages but the resulting good denture ridge was the aim

(*e*) To cover the possibility of a fracture a splint was constructed for the second operation This however was found to be unnecessary

(*f*) Comparison of materials for packing cyst cavities would appear to show the advantages of gauze and dentalone Complete absence of after pain quick and painless removal of packs and quick healing being the rule

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A CLINICAL TRIAL WITH TOPICAL HYDROCORTISONE ACETATE

BY

Surgeon Lieutenant-Commander R. H. BROUGHTON, R.N.

CORTISONE and hydrocortisone are crystalline steroids originally isolated from beef adrenals and more recently synthesized by a complex process from bile acid (Brunsting 1952). They do not cure disease by eradication of the cause nor do they repair damaged tissue. Their chief therapeutic value lies in their capacity to act as buffers to the reaction of tissue to injury, as well as block reactions of allergy and hypersensitivity. The blocking influence and suppressing effect act only as long as the hormones are administered (Ellcaris 1952).

Sulzberger (1952) considers the best results are obtained in contact dermatitis, urticaria and atopic dermatoses (endogenous nummular eczema, neurodermatitis, etc.) using systemic cortisone or ACTH. Unfortunately topical cortisone acetate has little or no effect on these conditions but hydrocortisone acetate has shown promise.

In passing it is interesting to note that Sulzberger speculates that psychotherapy may actually exert its therapeutic action by means of stimuli by suggestion to the cortex of the brain and thence via the hypothalamus and anterior pituitary to the adrenal cortex. Moreover investigations of this possible cortico-cortical pathway promise to open up far reaching opportunities for research into problems of mind and body.

Hydrocortisone acetate has not yet been extensively investigated but there are reports on its value from the U.S.A. and the M.R.C. is evaluating its efficiency.

Hielsen *et al.* (1954) used 1 per cent. strength in alcohol ointment in a trial involving a number of patients with different skin complaints. Their period of observation was too short to be conclusive but certain indications for its use were discovered. They treated 25 patients with anogenital eczema and in 19 of them there was a very good clinical response. Itching subsided in a few days and there was regression of lichenification of the skin. However the ointment needed to be continued for many months.

In 17 cases of discoid eczema there was an excellent response in 15. Here again treatment had to be maintained more or less indefinitely.

38 children with atopic eczema received treatment. 21 of whom showed a favourable result but were not cured.

3 out of the 4 cases of allergic eczema were symptom free in a few days.

It was concluded that treatment was expensive and symptomatic only. Topical hydrocortisone therapy had no place in such conditions as chronic discoid lupus erythematosus, pemphigus vulgaris, psoriasis, lichen planus, etc. There were no constitutional changes in the patients treated because there was no significant absorption. The drug may reduce resistance to infection locally.

With the small amount of hydrocortisone acetate ointment now available to hospitals it was proposed to carry out a limited clinical trial on a few recalcitrant skin cases. In the present survey 17 patients were treated with 2½ per cent hydrocortisone acetate ointment (*Cortril* by Pfizer and *Cortef* by Upjohn) over a period of up to three weeks, treatment being discontinued if no response occurred within a few days. Cases have been reviewed after two months and the data collected represent only a clinical impression over a short period in a few selected difficult cases and do not represent a scientifically controlled investigation.

Cases

Endogenous Eczema

Pensioner, aged 57.—He was admitted to hospital with bilateral endogenous eczema of the forearms, neck and thighs which was considered to be a physiogenic rash. He first developed eczema in the legs twenty years ago and was subsequently invalided from the Service. Since then numerous attacks have occurred mainly on the trunk. He was treated this time with hydrocortisone acetate ointment three times daily on the left forearm only, the right forearm being left as a control. Within seventy-two hours the left forearm improved remarkably with subsidence of erythema, papulation and fissuring, but the right side remained the same. However within a few days the right side also improved and the same extent and after a week both sides relapsed to their original condition. The ointment was then tried on both sides but there was only slight improvement. It is difficult to explain the rather haphazard response to treatment in this case.

Chief Yeoman Signal, aged 37.—He suffered from the first attack of acute eczema on the left calf and later there was an appearance on the right forearm. The ointment cleared both the eruptions rapidly in a few days and the right side of erythema responded to the paste. Four weeks later another attack of eczema developed.

C.P.O. Wren, aged 31.—Again on the previous occasion there was a quick improvement in a few days with rapid fading of minimal resistant local erythema. Skin trouble became an unremitting recovery with the paste. The eczema had been present four weeks before treatment was begun but has recently returned slightly.

L.E.M., aged 23.—For five weeks this patient had suffered from a recurrent discoid eczema on the dorsum of the left hand and two small patches on the dorsum of the left hand. Treatment with the ointment had improved. Sensitivity to lotions for lungs were negative. There is no response to the application of the ointment.

S.B.T., aged 22.—This S.B.A. had a symmetrical hyperkeratotic type eczema of the palms and fingers present for many years. There was no reason to suspect any particular irritants or sensitizers in this case. His brother suffered from asthma and his father had migraine. No treatment in the past had produced any lasting effect although the eczema cleared spontaneously from time to time. The trial ointment did not produce any change and indeed seemed to exacerbate the condition in the short.

Cd. Gunr., aged 35.—This officer had suffered from a chronic relapsing eczema of the fingers following injections of penicillin in various strengths. A patch test to the drug was positive. It was considered there was a large psychogenic overlay in this patient. In further attacks concomitant with times of stress and difficulty there resembled a constitutional endogenous eczema affecting the arms and other exposed parts. The trunk and other skin were unaffected. Penicillin and attempts at desensitization were unsuccessful. Penicillin undoubtedly appeared to have triggered the initial disruption. The trial ointment was again applied for this case.

A.B., aged 30.—Had for months past an eczema on the right upper lid. As a child he suffered from constitutional eczema, hay fever and migraine. There was an excellent response to the ointment with rapid assuagement of signs and symptoms in twenty-four hours. However the eczema relapsed in spite of continuing the ointment.

[illegible]

[illegible]

Rating	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pensioner	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ch Ven N C	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C F O Wen	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L E M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
S B A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gil Gne	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A B	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F O Y	27	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tenement	68	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tenant	38	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L/Cook	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
H/Wife	29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A B	24	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	58	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wen	18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
S B A	21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

Hydrocortisone acetate [illegible] useful adjunct to dermatological treatment but has [illegible] it should not be thought does not cure and is strictly [illegible] Moreover [illegible] pigment

The results of the present small series show that on the skin the drug is disappointing but in [illegible] treatment of [illegible] no matter what age is the patient [illegible] the initial response is usually very good However [illegible] symptoms but only as long as treatment lasts [illegible] temporary expedient to tide the patient over [illegible] methods of treatment can be started The [illegible] subject to stage can thereby be shortened and the [illegible] itching and further flare up can thus be avoided

Summary

Seventeen patients with recalcitrant skin [illegible] with a history varying from one month to twenty years were treated with [illegible] per cent topical hydrocortisone acetate over a period of up to three weeks and reviewed two months later

The group consisted of 10 patients with endogenous eczema 4 patients with exogenous eczema 2 patients with neurodermatitis and 1 patient with chronic obliterative lymphangitis

All except 4 patients showed an immediate good response to therapy and one was made worse.

All relapsed immediately on cessation of treatment and no permanent alteration in the course of each skin disease occurred.

I am indebted to Surgeon Rear Admiral R. W. Mussen, C.B., C.B.E., Q.H.P., for permission to publish this article.

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◆

Reviews

M[illegible] IN ITS HUMAN SETTING. By A. [illegible]rk Kennedy, M.D., F.R.C.P., Physician [illegible] London Hospital and formerly Dean of the Medical College, Fellow of Corpus [illegible] College, Cambridge. [illegible] M.S.I.A., Medical Artist [illegible] Hospital Medical School. 1954. Pp. 276. London: Faber & Faber. [illegible]

[illegible] of the first [illegible] this book presents medicine in new and realistic [illegible] picture the science and art [illegible] and failures [illegible] and [illegible] The author [illegible] has [illegible] medical information [illegible] and although there are no [illegible] that the discomfort [illegible] We are taken [illegible] lives of fourteen patients [illegible] illustrate the clinical [illegible] of a particular disease process [illegible] We see the disease [illegible] as well as the general practitioners. The patients [illegible] from which they [illegible]

[illegible] has [illegible] book [illegible] carefully. Yet it [illegible] how much [illegible] details not strictly essential [illegible] having been [illegible] without burdening the thread of the tale [illegible] and the author [illegible] that one begins to [illegible] It seems he cannot possibly [illegible] the author [illegible] glasses.

[illegible] this book is intended primarily for the junior clinical student but any [illegible] interesting [illegible] by its [illegible] the [illegible] of Sylvia [illegible] in its human setting, [illegible]

[illegible]

[illegible] M.D. [illegible]

Reprinted [illegible] 1955 [illegible]

Bailliere [illegible]

This [illegible] publication [illegible] primarily [illegible] Dr. [illegible] of medical [illegible]

[illegible] and [illegible] well [illegible] general [illegible]

[illegible] sulphur [illegible] practice [illegible] approaches [illegible]

[illegible] many [illegible] formulae [illegible]

It will [illegible]

[illegible]

[illegible] Nurses [illegible] there [illegible] hospital. [illegible] in the [illegible] [illegible] specialist [illegible] and well [illegible] although [illegible] and [illegible] public [illegible] [illegible] have been [illegible] carefully [illegible] clearly printed and [illegible]

[illegible] 1954 [illegible] 288 [illegible]

[illegible]

This [illegible] in the [illegible] and Royal Navy [illegible] [illegible] different [illegible] [illegible] [illegible] temperature [illegible] [illegible] [illegible] of the [illegible] [illegible]

[illegible]

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We acknowledge with thanks receipt of the following publications

[illegible]

[illegible]

[illegible]

[illegible]

Notice

NON-SERVICE SUBSCRIPTION RATE

[illegible]

ROYAL NAVAL MEDICAL SCHOOL

Surgeon Commander P. W. Edmondson, M.R.C.S., L.R.C.P., joined on 28th February for duty at A.E.R.E., Harwell.

The school has most regrettably said goodbye to the oldest member of the civil staff—Mr. R. C. Frederick, *V.B.E.*, Adviser in Applied Hygiene to the Medical Director-General of the Navy, who retired on 16th January, 1954.

Mr. Frederick joined the school as a skilled assistant in July, 1912, when the school was first established in the Royal Naval College, Greenwich. In 1921 he became Demonstrator in Hygiene, in 1928 assistant to the Professor of Hygiene, and in 1941 Adviser on Applied Hygiene to the Medical Director-General—a unique appointment which he held with skill and dignity up to the date of his retirement. Mr. Frederick had an unsurpassed knowledge of naval hygiene and he was a member of many committees and advisory panels dealing with climatic efficiency, ventilation, water purification, industrial health, disinfectants, etc. He was also a member of various committees of the British Standards Institution.

We wish him a long and happy retirement.

Courses on the Medical Aspects of Radiological Warfare continue. Ministry of Health medical officers ceased attending in April, 1954, but nursing officers still attend from all parts of the country. Owing to the smaller demands, the number of courses for medical officers has been reduced to approximately one per quarter. Up to the 31st December, 1954, a total of 4,367 medical, dental and nursing officers had attended.

A new course on the Medical Aspects of Underwater Warfare and Survival has been instituted (A.F.O. 209/54). The first course took place in February and proved interesting and instructive. The following subjects were included:

Physical properties of gases. Physiology of respiration. Oxygen poisoning. Nitrogen narcosis. Anoxia. Decompression sickness. E.N.T. problems in diving. Pulmonary barotrauma. Submarine escape. Pathology and treatment of blast injuries. Clearance diving. Mine recovery problems.

Practical demonstrations were given at R.N. Physiological Laboratory and also included visits to a submarine and the submarine escape tower at H.M.S. *Dolphin*, the use of rafts and immersion suits and rescue by helicopter at the Air Medical School, practical diving and the use of diving equipment at H.M.S. *Vernon*. These courses will be repeated four times each year.

Senior Officers' Technical Courses visited the school on 19th July, 17th November, 1954, and 28th February, 1955.

The new instructional film entitled "Treatment of Dental Emergencies by Medical Staffs" was completed and shown for the first time at the Admiralty Cinema, Whitehall, on 13th December, 1954. The Medical Director-General of the Navy, Surgeon Vice-Admiral Sir Alexander Ingleby-MacKenzie, *K.B.E., C.B., Q.H.P.*, introduced the film to an audience of a hundred comprising the medical and dental deans of teaching hospitals and their staffs, medical and dental officers of the three Services, and liaison officers of overseas forces.

serving in this country, members of the Diplomatic Corps and other interested people.

After the showing of the film the guests were received in Admiralty House by the First Lord of the Admiralty, The Rt. Hon. J. P. L. Thomas, M.P., and the First Sea Lord, Admiral of the Fleet Sir Rhoderick R. McGrigor, *G.C.B., D.S.O., LL.D.*

The film (16 mm. colour, sound) in four parts, runs for approximately fifty minutes and shows in detail the instruments and operative procedures involved in the treatment of all forms of dental emergency. In addition to the main film, short films (Loops—running time one minute) which can be used independently and repeated as often as necessary, show the technique for the extraction of individual teeth.

The pictures are provided partly by a naval dental officer working with his Wren dental surgery assistant on patients in a surgery, and partly by coloured acrylic and soft vinyl resin models.

A small dental laboratory was completed on 10th January, 1957, and experimental work in the use of nylon as a denture base was commenced. Mr. F. A. McCallum, *B.E.M.*, Demonstrator Dental Technician of R.N. Barracks, Portsmouth, has been appointed for duty with the Director of Dental Studies.

A meeting of the dental officers, Portsmouth area, was held on 24th January, 1957, when the new instructional film was shown. A demonstration of the nylon injection press was also given.

The deputy Director for Dental Services, Surgeon Rear-Admiral (D) J. B. Osborne, F.D.S., Q.H.D.S., visited the school on 4th February to inspect dental arrangements.

The Director of Dental Studies visited R.N. Hospital, Plymouth, and R.N. Barracks, Devonport, on 8th February, to introduce the new instructional film. A large audience of medical and dental officers of the Port, nursing officers, sickberth staff and medical and dental officers of the Army and Royal Air Force attended. A demonstration of acrylic and soft vinyl resin models was also given.

Instruction of newly entered medical officers in the treatment of dental emergencies has now been instituted, and lectures, films and demonstrations are given to dental surgery attendants under training.

A meeting of dental officers, Portsmouth area, was held on 8th March. Surgeon Commander (D) P. S. Turner, R.N. (Senior Specialist in Dental Surgery) gave a very instructive lecture on "A Year's Interesting Cases in R.N. Hospital, Haslar." By X-ray and coloured slides he demonstrated a wide variety of conditions including cysts, impactions, unerupted teeth, fractures of jaws, and finally one case of dentinogenesis imperfecta.

The American film "Hazards of Dental Radiography" was shown after the lecture.

News of the Service

OBITUARY

[illegible] R. J. WILLIAN, *CBE*, M.D., [illegible] 177. He qualified in Dublin [illegible] 1907. [illegible] first World War with the R.N.V.R. [illegible] in 1919, during which [illegible] *OBE* for valuable service [illegible] In 1930 he was appointed [illegible] the Retired List (as a [illegible] 1936.

[illegible] W. H. War Surgeon Rear Admiral Will[illegible] R.N. [illegible] In 1946 he was appointed [illegible] Admiral Will[illegible] was [illegible] Professor of Gun[illegible] 1938. [illegible] the rank of Surgeon Rear Admiral in the Royal Navy [illegible] Hunter and several other [illegible] at the R.N.H. [illegible] 1949.

[illegible] REES, *MC*, R.N. (Ret.), died on the [illegible] 1885, [illegible] 1908 and [illegible] R.N. [illegible] 1901. He was promoted [illegible] 1921 and was placed [illegible] 1928.

[illegible] last served in H.M. Ship [illegible] *OBE* in 1919. [illegible] World War II he was recalled [illegible] R.N. [illegible] Transport and R.N. Sick [illegible] the Retired List.

[illegible] MARSDEN, R.N., died after a [illegible] illness [illegible] Passed the early age of 37.

Mr. [illegible] (Ret.) in 1941 and entered the Royal [illegible] R.N.V.R. on the 9th October [illegible] R.N. on the 19th December, 1945. He was [illegible] on the 9th January, 1948. [illegible] Acting Temporary Surgeon Com[illegible] 1951. [illegible] World War II he served at R.N. [illegible] H.M.S. *Indefatigable* and in H.M.S. [illegible] R.N. Hospital Sydney.

[illegible] *George* [illegible] In 1947 he was [illegible] to R.N. [illegible] to R.N. Hospital Chatham [illegible] the [illegible] March, 1950 [illegible] H.M.S. *Cal*[illegible] in November, 1952 to R.N. [illegible] Chatham [illegible] October, 1954 when he was appointed [illegible]

[illegible] met Marsden when he was [illegible] 1919. His deceptively [illegible] It was not long before [illegible] was seldom at fault when [illegible] Ukraine looks gladly [illegible] his little swap [illegible] subject [illegible] all. This [illegible] if what [illegible]

[illegible] Surgeon [illegible] after the [illegible] but something [illegible] Medical [illegible] Ship were [illegible] Marsden [illegible] for [illegible] own circle [illegible]

[illegible] (Rtd) [illegible] 5th June [illegible] in 1891 and [illegible] R.N. Medical [illegible] 1897. He was promoted to Surgeon Captain in 1908. [illegible] the Retired List [illegible] February 1913 [illegible] to serve on the [illegible] in 1914 [illegible] and [illegible] H.M.S. [illegible] in December 1916.

[illegible] (Rtd) [illegible] 4th March [illegible] 1891 and [illegible] R.N. Medical [illegible] Surgeon Captain [illegible] 1908. Surgeon [illegible] in April 1914. [illegible] H.M. Ship [illegible] Surgeon [illegible]

AWARD

Further Mention in Despatches 1954

[illegible] 1954 has been awarded to Surgeon Commander [illegible]

PROMOTIONS

[illegible] Surgeon Captain D. Duncan *O.B.E.*

[illegible] Rtd.—J. A. B. Hairson, I. J. O'Kelly, P. J. [illegible]

[illegible] S. [illegible]

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PROMOTIONS

[illegible] Superintending Sister—Miss M. C. Harvey. Miss J. B. Ashcroft, A.R.R.C.

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Articles

PRINCIPLES AND TECHNIQUE OF FREE ASCENT IN SUBMARINE ESCAPE

BY

Surgeon Lieutenant Commander W. E. CROCKER, R.N.

SINCE the submarine first became an effective weapon of war at the beginning of this century a variety of methods enabling the crew to escape if the vessel fails to surface have been devised. Some have proved to be valuable life saving measures but many others have been unsuccessful because they failed to overcome the physiological hazards involved or were incompatible with the principles upon which submarines are designed and operated.

The submarine more than any other warship spends the greater part of its operational time out of contact with friendly forces and in waters controlled by the enemy. Any escape apparatus to be effective must be designed to operate independently of surface vessels and immediate friendly aid. It is, moreover essential that a reasonable balance should be struck between the efficacy of the escape method and the fighting qualities of the ship. There is a limit to the amount of escape apparatus with which a submarine can be equipped without affecting its warlike attributes and, if this limit is exceeded, the whole purpose of the safety measures may be defeated by rendering the vessel more vulnerable to enemy action or to the normal hazards of the environment in which it operates.

The submarine service has recently started to train its personnel in a new method of escape which goes farther than any other to meet the foregoing conditions. In this method the survivors ascend to the surface without breathing apparatus and to appreciate its advantages, it is necessary to consider the existing escape routes and apparatus and their shortcomings.

EXISTING METHODS

Existing methods may be divided into those requiring help from the surface and those in which the survivors reach the surface by their own efforts. The first group includes the raising of the submarine by salvage methods and an American invention known as the Rescue Bell. The latter is a diving

chamber divided into an upper and lower compartment with a communicating hatch It is lowered to the sunken submarine and fits over a specially designed hatch so that a watertight seal is made allowing members of the crew to climb into the Rescue Bell with safety When there is a full complement in the upper compartment both hatches are closed the seal is broken and the bell rises to the surface This operation is repeated until all the crew have been saved The whole process takes place at atmospheric pressure so no physiological problems are involved

All methods requiring surface ships need a considerable amount of good fortune to be successful Firstly the surface forces have to get to the scene of the disaster and locate the submarine with considerable accuracy Secondly the crew must be rescued before they succumb to the accumulation of carbon dioxide and oxygen depletion in the submarine's atmosphere and finally such methods are at the mercy of weather tide and the enemy in time of war For these reasons salvage methods have no place in the Admiralty Submarine Escape policy and the Rescue Bell is intended to be used at greater depths than those permissible for individual escape

Experience has shown that forms of escape which are independent of assistance from the surface are likely to result in the greater saving of life even though the attendant physiological hazards make any escape a risky undertaking except from the shallowest depths These hazards arise from the fact that the survivors must be exposed to an ambient pressure equal to the depth of water in which the submarine is lying before it is possible to open a hatch and get out There are two ways in which the pressure of the escapee's environment is equilibrated with the outside sea pressure

The first is known as Compartment Escape The members of the crew congregate in certain compartments towards the ends of the submarine which are isolated from the flooded parts by watertight doors These compartments are fitted with hatches from which a collapsible twill trunking is lowered to within a few feet of the deck Valves are then opened to admit sea water and as the water level rises the air in the compartment is compressed When the pressure is equalized the water stops rising and the hatch may be opened The trunking fills with water and prevents air escaping through the hatch because the bottom of it is below the surface of the water The air trapped in the compartment prevents any further rise of water when the hatch is opened The survivors may then duck inside the trunking and rise through the hatch to the surface

The other route is by a special chamber built into the hull of the submarine by which the men leave singly or in pairs The chamber is flooded till the pressure is equalized the pocket of air remaining is vented through a small valve into the sea the hatch is opened and the escapee floats upwards

Escapes by either of these routes give a reasonable chance of success from depths down to 300 feet but below 300 feet the effects of nitrogen narcosis while under pressure and decompression sickness after surfacing reduce the chances of survival so drastically that the Rescue Bell even with its disadvantages becomes the method of choice

Oxygen breathing sets were until recently used in conjunction with these two escape routes These sets (the Davis Submarine Escape Apparatus) were intended to be worn during the flooding period and the ascent and provided the buoyancy necessary to bring the man to the surface Although many lives have been saved with this apparatus it has two main drawbacks The first is that oxygen has poisonous effects when breathed in high concentrations at great depths and the second is that like all other diving gear it demands a certain degree of composure and self discipline on the part of the user—qualities which may be lurking under the conditions of a submarine accident

In April 1946 an Admiralty Committee under the chairmanship of Rear Admiral P Buck Keene *C B E D S O* was set up to review existing methods of escape and to make recommendations for future development It collected a great deal of data concerning all previous submarine disasters in our own and foreign navies and interrogated many witnesses who themselves had made successful escapes

The Buck-Keene Committee found that a surprising number of men reached the surface without any kind of breathing apparatus It also learned that many other men who had sets used them incorrectly and lost their lives It was also aware of the fact that oxygen is liable to have toxic effects if breathed at pressures of more than 2 atmospheres absolute These three facts encouraged the committee to enquire more closely into the possibilities of ascents without apparatus and finally to recommend its adoption as a standard method of escape

The new form of escape became known as Free Ascent and the principles upon which it depends will now be considered

A man of average build is buoyant because he weighs less than the water he displaces The degree of buoyancy and therefore the rate at which he rises through the water depends upon a number of anatomical factors particularly the relationship between the size of his thorax and the weight of his solid tissues Consequently the rate of ascent depends upon the degree of lung inflation if the lungs are expanded he rises if they are deflated he sinks

At the beginning of the ascent the lungs are filled with air at a pressure equivalent to the depth of water As the man ascends the air in his lungs expands as the pressure decreases (Boyle s Law) and the excess must be allowed to escape from the mouth If the breath is held the intra-pulmonary pressure rises above that of the surroundings and the lungs may be damaged On the other hand if he exhales too quickly he will lose buoyancy and sink

The man s oxygen supply depends upon the amount contained in his lungs at the beginning of the ascent This being at a high partial pressure is more than adequate in the early stages but the volume lost by exhalation and his own oxygen consumption introduces the risk of anoxia during the later stages of a prolonged ascent

The carbon dioxide produced during the ascent is partly eliminated by exhaling but again if the ascent is prolonged the partial pressure in the alveolar air may rise to a dangerous degree In such circumstances the oxygen

lack and carbon dioxide accumulation, being the main stimuli to respiration, may force the subject to breathe water into his lungs before reaching the surface and drown

Rate of Ascent and Buoyancy

From these principles, it becomes obvious that buoyancy and rate of ascent are the factors upon which the success of the method depends The Ruck Keene Committee realized that if the method were to be adopted it would for reasons already mentioned have to be practicable for depths down to 300 feet and doubts arose as to whether a man s natural buoyancy would be sufficient to bring him up from such a depth with safety It was therefore, decided to carry out experiments at the Royal Naval Physiological Laboratory to determine the optimum rate of ascent

In these experiments reported by Taylor (1953) human subjects were compressed while sitting in a tank of water inside a chamber to the equivalents of depths from 35 feet to 300 feet of water They then put their heads under water and exhaled continuously while being decompressed to atmospheric pressure It was deduced from these experiments that the optimum rate of ascent is about 4 feet per second and that the ascent from any depth should not take longer than a normal man s limit for breath holding which is about 1½ minutes The rate of ascent with natural buoyancy however is only 2½ feet per second and is quite inadequate for an ascent from 300 ft

A further argument against free ascent with natural unaided buoyancy is that it requires a considerable degree of skill and experience to be successful The novice is liable to breathe out too fast so that he loses buoyancy and sinks or he holds his breath in order not to sink and damages his lungs These considerations caused the Ruck Keene Committee to decide that if the method of free ascent were to be introduced, it would have to be carried out with some form of artificial flotation to bring the survivors up at the requisite speed

Pulmonary Barotrauma

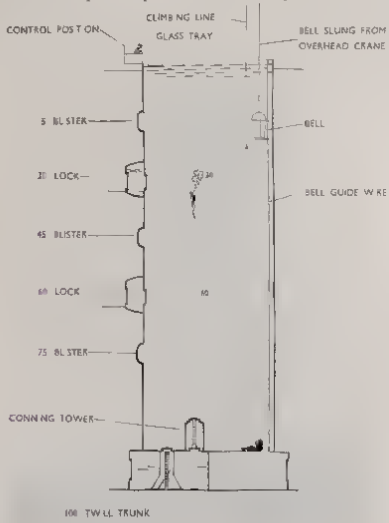
The main hazard of free ascent results from an increased intrapulmonary pressure and is known as Pulmonary Barotrauma or Traumatic Air Embolism It is not confined to free ascent and may occur with any kind of diving apparatus if the breath is held while the ambient pressure is decreasing- It was first described by Adams and Pollak (1932 and 1933) The excess intrapulmonary pressure stretches and ruptures the alveoli and air is forced into the interstitial tissues and spreads to the mediastinum In more severe cases air is forced into ruptured pulmonary vessels and enters the systemic circulation as an embolus The resulting manifestations vary from transitory disturbances of vision, speech or sensation to convulsions pareses and even sudden death from frothing in the chambers of the heart

Free Ascent in Practice

The United States Navy has been training its personnel in free ascent for many years- Instruction is carried out in a diving tank 100 feet high and

the trainees start their ascents from air locks placed at intervals between the bottom of the tank and the surface. Natural buoyancy only is used but the trainees come up a line hand over hand so there is no danger of sinking should they breathe out too fast. Although considerable experience has been gained in this technique, the primary escape route in U.S. submarines is the Rescue Bell and free ascent is still only an alternative to other methods.

For reasons stated earlier the Admiralty's escape policy favours techniques which are independent of surface assistance and feasible for any depth from which an ascent is a physiological possibility. It is considered that free ascent with artificial buoyancy is the only method which meets these requirements and a 100 ft. tank similar to those in the United States has been built at Fort Blockhouse, Gosport, to put these views into practice.



100 ESCAPE TRAINING TANK

FIG. 1

In the British method, the subject wears an inflatable life jacket of 14 litres capacity so that his buoyancy is no longer dependent upon his lungs. He can therefore breathe out fast and keep his lungs relatively empty with no danger of sinking.

Fig. 1 is a diagrammatic drawing of the tank. It is a cylindrical tower of water 100 ft. high inside a ten storey steel-framed building, which contains a lift shaft and a staircase. The spaces on each floor between the tank and the outer structure are used for offices, changing rooms and classrooms, etc.

Air locks are fitted into the side of the tower at 30 ft. and 60 ft. below the surface. These chambers are large enough to hold eight men standing and have two watertight doors, the outer opening on to a landing and the inner giving access to the tank. The trainees enter the lock from the landing with the tank side door, of course, closed. The landing door is then shut and the chamber is flooded through a valve communicating with the tank, until the pressure is equalized, leaving an air space in which the men can breathe. The

100' ESCAPE TRAINING TANK—EXTERIOR VIEW

tank side door which is now submerged, may then be opened in readiness for the trainees to commence their ascents

Ascents are also carried out from a chamber beneath the tank which has a hatch and twill trunk similar to those fitted in submarines

Training Technique

While training is in progress instructors are working at various levels in the water without breathing apparatus Their function is to escort the trainees on their way to the surface and see that they exhale correctly These men have reached a high degree of amphibious proficiency and are accustomed to holding their breath for long periods under water Three or four work from a diving bell containing a pocket of air which can be lowered to the depth from which the ascents are starting Instructors patrolling other levels use blister bells which are small recesses built into the wall of the tank at 15 45 and 75 ft from the surface It will be seen from the diagram that the roofs of the blisters are higher than the entrances leaving an air pocket in which the instructors breathe while resting between each ascent

At the top of the tank there is a control position manned by The Escape Training Officer who directs operations through an intercom system connected to the air locks the submarine compartment and the diving bell

There is also a Recompression Chamber at the tank top for the treatment of cases of decompression sickness or embolism should they ever occur

The following description of the procedure when ascents are starting from the 30 ft lock is given as an illustration of the training technique

Upon the order stand by being received over the intercom two instructors from the bell swim across and station themselves outside the the lock Another descends from the 75 ft blister bell and waits in a position just above the lock so that he can see the trainee s mouth clearly as he emerges The latter having inflated his life jacket takes a deep breath and checks out through the door backwards whereupon he is grasped by the belt by the two instructors and held there until he is seen to be exhaling correctly

When the third instructor above him sees the bubbles leaving his mouth and is satisfied that all is well he taps four times on the side of the tank with a small hammer the trainee is released and ascends rapidly to the surface

When ascents start from 60 ft an additional instructor is stationed in the 30 ft lock and when the submarine compartment at the bottom of the tank is being used both the locks above are manned The instructors from the locks and others on the surface patrol the 30 ft of water beneath them while an ascent is in progress ready to go to the assistance of any trainee in difficulty

At the time of writing 1 288 subjects have completed the course which is compulsory for all submariners Each man makes five free ascents the first being from the bell at 15 ft without buoyancy so that he may become accustomed to breathing out under water while ascending slowly under the control of an instructor The remaining ascents are carried out with artificial buoyancy in the manner described. Over 5 000 ascents have been successfully completed and no cases of pulmonary barotrauma have occurred It is early

to draw conclusions but it seems that the risks if any, of the British free ascent technique are slight Indeed the only medical problems that have arisen have been concerned with minor damage to ear drums and sinuses during compression in the locks The subjects affected are usually suffering from catarrh or other temporary conditions of the eustachian tubes middle ears or sinuses and are therefore unable to equalize the air pressure in these organs with that of the exterior while the ambient pressure is increasing

CONCLUSION

The prospect of having to escape from a sunken submarine is not pleasant and submariners not unreasonably dislike undue emphasis being placed upon the hazards of their calling Escape training was formally carried out with the D S E A in a small tank 18 ft deep and was regarded by many as an irksome though necessary interlude in their general training Those however who have been trained in free ascent have with few exceptions found it an exhilarating experience and have returned to their submarine fortified by the knowledge that they can, if necessary escape with the help of nothing but their own bodily resources

I would like to express my thanks to the Captain 5th Submarine Squadron and Flag Officer Submarines for permission to publish this article

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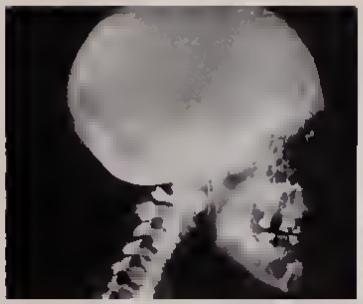
HEREDITARY CLEIDO-CRANIAL DYSOSTOSIS

BY

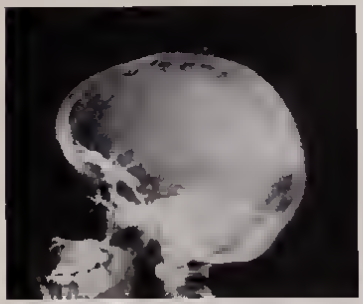
Surgeon Commander (D) D. L GOODRIDGE, R N

HEREDITARY cleido cranial dysostosis is a condition due to prenatal arrest in development of some of the bones of membranous origin at a certain stage with continued development of the remainder There is also a delay in eruption of certain teeth which seem to lose their power and direction of eruption owing to a confused fibrous capsule which replaces the normal teeth crypt and gubernaculum In addition supernumeraries are usually present together with thickening of the mucous membrane over the alveoli

The symptoms were first described nearly 200 years ago by Morand in 1760 and were recognized as a syndrome in 1898 by Marie and Sainton and described more fully in 1904 by Comby who gave the disease its present name At the turn of the century there were several reports of the condition but there has not been of recent years much interest shown in a condition which is, to all intents and purposes of only academic importance The author recently



[illegible] clearly [illegible] with [illegible] skull (2) shows the [illegible] difference in [illegible] facial bone



Normal [illegible] view

came across the disease in a mother and son who belong to a family on which Lowin Payne (1929) made an extensive report. The author incidentally had seen and examined the mother at Guy's Hospital in 1932 when she was a child of 13 and to the surprise of the woman (and himself) recognized her twenty two years later. The cases reported in this paper describe the condition of this woman of 34 who required operative treatment and in her son aged 11, together with the family tree (Diagram II page 148) and additions thereto brought up to date (Diagram III).

X RAY 3

Case 1—P A view showing the frontal metopic suture

X RAY 4

Case 1—Observe the bone defects in both clavicles and the cervical ribs

Case 1—Female aged 41 [illegible] complained of vague bilateral facial pains and headaches for several years. The [illegible] distributed to unerupted 3|3 which had been shown in X ray [illegible] examination it was observed that the patient had the typical facies of this syndrome and she was personally recognized. There was flattening of the mid line of the frontal bone with frontal bossing. The bridge of the nose was depressed and there were obvious dental abnormalities. There was some lordosis and

[illegible] but she had large [illegible] alveolar ridges which nearly [illegible] thickening of the areas where the teeth were absent [illegible] soft mucous membrane. $\frac{54|45}{654|456}$ were erupted and [illegible] X rays showed $\frac{873|38}{83821|12838}$ to be unerupted [illegible] in the middle of the ramus of the mandible. She gave a [illegible] of surgical extractions at various times of $\frac{6|67}{7|67}$ which had [illegible]

General. X [illegible] the frontal eminences rather shortened bone persistent [illegible] small facial bones. Shoulder girdle both clavicles [illegible] and rudimentary cervical ribs are present.

It seemed [illegible] possibly $\overline{3|3}$ were causing the headaches and it was [illegible] These extractions together with $\overline{|6}$ root were done [illegible] difficulty in exposure of the crowns [illegible] the soft tissues and the high position







Dental X ray. Four upper and three lower

[illegible] operated [illegible] healing and [illegible]

Three weeks later [illegible] further extraction to eliminate [illegible] extract 3821|1258 under [illegible] stated it would be necessary [illegible] lying in the rami of the mandible.

Under endotracheal anæsthesia [illegible] to 4. Again there was [illegible] very tough fibrous capsules [illegible] Each tooth was completely [illegible] mesial border giving an impression [illegible] area of fibrosis. The pathologist [illegible] only with an area of structural [illegible] levels from the ridge to the [illegible] the removal of the upper plate with [illegible]

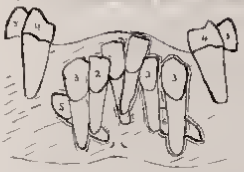
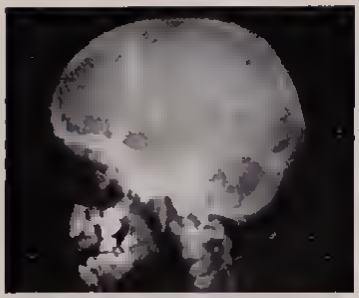


DIAGRAM I

turn elevated out. After 3 had been removed 5 completely [illegible] attached to the capsule of 3 teeth, [illegible] was lifted. The [illegible] into position and normal healing took place. Two months later [illegible] recurrence of pain or headaches. Prosthetic restorations were then made. [illegible] after operation there were no complaints.

Case II.—Whilst Case I was being treated her son aged 11 [illegible] order to decide whether any extractions might be required [illegible] might be. The boy was of normal height but narrow shoulders [illegible] evident frontal bossing and the outline of a large frontal fontanelle [illegible] was unilateral wasting of the shoulder girdle on the right side which [illegible] to anterior poliomyelitis as he had had an anterior [illegible] age of 6. The right clavicle was vestigial with about 1/3 [illegible] As he brought his shoulder forward the clavicle stuck up [illegible] sterno-mastoid muscle. To lift weights with the right arm he [illegible] right and used his chest as a support. Otherwise he appeared [illegible] size and strength of his biceps and forearm muscles equal.

Dentally he showed several abnormalities: 6 [illegible] 456 [illegible] 1 [illegible] 1e456 [illegible] 875321|12378 [illegible] 8754321|2378 [illegible] erupted and 1|1 partly erupted and rotated [illegible] was delay in development of 7|7 / 7| and a supernumerary in the mid line. [illegible] 753|137 / 32|23 seemed unlikely.



X-RAY 5

Case II—[illegible] is shown also small [illegible] bones and occi[illegible] eminences

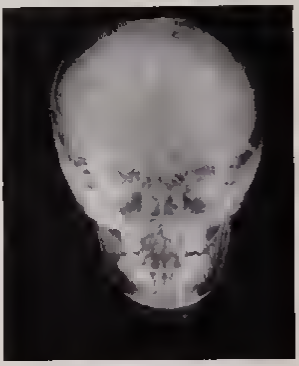
X-RAY 6

Case II—Defect in right clavicle and cervical ribs are seen together with scoliosis

[illegible] commences a persistent [illegible] bones are relatively small [illegible] the mid third simulating an [illegible] of bilateral rudimentary [illegible]

The family trees show quite definitely that the normal children carry no trace of the disease into the next generation. The affected members are of a dominant strain. In the first generation of 10 children 7 were abnormal, 2 normal and 1 doubtful. In the second generation of 15 children 7 were

abnormal 5 normal and 3 indefinite. In the third generation of 5 children, 2 were abnormal 1 normal and [illegible] were. The sexes were affected equally.



X-RAY 7.

Case II — 3 A[illegible] Shows large fr[illegible] defect [illegible] suture. Un-erupted teeth are [illegible]

X-RAY 8.

Case II — Observe the movement of the sternal free end of the clavicle by the action of the sternomastoid muscle.

Dental X rays four upper and five lower

Discussion

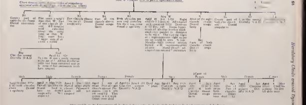
Lewin Payne's description of the general condition is very full and he brings out the following points all of which were observed in the cases reported

(i) The skull is brachycephalic and there are fontanelles which remain open until adult life

(ii) One or both clavicles are affected equally in both sexes

DIAGRAM II

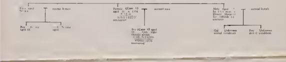
Mrs. W.'s Father. Only a part of right clavicle absent.



Abstracted from the Transactions of the British Society for the Study of Orthodontics by kind permission of the Society

DIAGRAM III

Additional Chart 1954



(iii) Membrane bones only are affected This may not be completely accurate as shaft of the clavicle has its origin in membrane while the extremities are cartilaginous

(iv) There is mandibular protrusion which is perhaps rather maxillary retrusion Palate is high gums are hypertrophied Delay in eruption of teeth is a constant feature

The following common points were noticed The mother of Case I also reported originally complaining of neuralgic pains in middle age Her alveolar ridges were thickened and hypertrophied and in operation a tough fibrous capsule was found surrounding the unerupted teeth

SUMMARY

The syndrome of hereditary cleido cranial dysostosis is briefly discussed and two cases are reported

I should like to acknowledge thanks to Surgeon Commander E B Bradbury, R N who has advised me on the radiographic and osteologic aspects of this paper and whose reports are quoted The British Society for the Study of Orthodontics kindly gave me permission to abstract the family tree of the W family from their Transactions

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CLASSIFIED MEDICAL REFERENCES IN THE WORKS OF SHAKESPEARE

BY

Surgeon Commander J W L CROSFILL, R N

PART IX

NERVES

1100 *Macbeth* Take any shape but that and my firm nerves
Shall never tremble —*Macbeth* iii 4

1101 *Prospero* Thy nerves are in their infancy again
And have no vigour in them —*Tempest* i 2.

1[illegible] *Hamlet* — My fate cries out
And makes each petty artery in this body
As hardy as the Nemean lion's nerve.—*Hamlet* i 4

1103 [illegible] — Thou great Commander, nerve and bone of Greece —
Troilus and Cressida i 3

11[illegible] *Me*[illegible]*s* — The strongest nerves and small inferior veins
From me receive that natural competency
Whereby they live.—*Coriolanus* i 1

Nightmare

1105 *Lady Percy* — And those hast so bestirred thee in thy sleep
That beads of sweat have stood upon thy brow
Like bubbles in a late-disturbed stream
And in thy face strange motions have appeared
Such as we see when restrain their breath
On some great sudden hest.—*Henry IV* Pt 1 ii 3

Nose

1106 *Clown* — Why, masters, have your instruments been in Naples
that they speak i' the nose thus?—*Othello* iv 1

(Meaning that they have caught syphilis in Naples and their voices have suffered as a result of syphilitic destruction of the palate and nose.)

1107 *Othello* — What committed!
Heaven stops the nose at it, and the Moon winks.—*Othello* iv 2

1108 *Cloten* — as I said, there is no more such Cæsars; others of them may
have crooked noses, but to owe such straight arms, none.—
Cymbeline iii 1

(Might not Cæsar's drafiness here been associated with a deflected septum?)

Nose Bleeding of

1109 *Marcius* — For that I have not wash'd my nose that bled.—*Coriolanus* i 9

1110 *Rudolph* — Yea, and to tickle our noses with spear grass to
make them bleed.—*Henry IV* Pt 1 ii 4

(Gerard recommends Horse Taile or Shave Grass for bleeding noses. Dioscorides said that Horse Taile being stamped and laid to cloth perfectly cure wounds, yea although the sinews be cut in sunder, as Galen saideth. The leaves drunke either with water or wine is an excellent remedy against bleeding at the nose.)

1111 *Falstaff* — It was not for nothing that my nose fell a bleeding on
Black Monday last at six o'clock i' the morning.—
Merchant of Venice ii 5

Nurse

1112 *Timon* — Gold! yellow, glittering, precious gold!
Why this
Will lug your priests and servants from your sides
Pluck sick men's pillows from below their heads.—
Timon of Athens iv 3

(According to the belief that nurses remove the pillows of dying people to expedite their death. I met this belief in another form in 1928 when a patient refused to go to hospital, stating that she was only being sent there to die, as if that this would be brought about by the nurse who would put pillows over her face while she was asleep! The same belief is recorded in Defoe's Journal of the Plague, wet cloths being supposedly placed over patients' faces.)

1113 [illegible] Hubert? You look pale to-day
[illegible] I told you were a little sick
[illegible] sit all night and watch with you —*King John* iv 1

1114 *Arthur* [illegible] you at your sick service had a prince —*King John* iv 1

1115 *Verges* If you hear a child cry in the night you must call
to the nurse and bid her still it

2nd Watchman How if the nurse be asleep and will not hear us?

Dogberry Why then depart in peace and let the child wake
her with crying —*Much Ado About Nothing* —iii 3

1116 *Adriana* I will attend my husband to be his nurse
Diet his sickness for it is my office —*Comedy of Errors* v 1

Nursing by Wild Animals

1117 *Antigonus* Come on poor babe
Some powerful spirit instruct the kites and ravens
To be thy nurses! Wolves and bears they say
Casting their savageness aside have done
Like offices of pity —*Winter's Tale* iii 3

(There are several reports of children having been reared by wild animals mostly in Asia in origin the animals being wolves The *Lancet* for 1888 contains an account of a pamphlet published in Plymouth in 1528 in which six cases are recorded all boys having been rescued from their wolf foster parents It is allowed that as might be expected the recovered children cannot speak although they appreciate signs They appear to have either forsaken or not learned the upright posture as they present bad like thickening of the skin over the elbows and knees due to their copying the mode of progression of their animal parents They eat raw meat gnaw bones resent the presence of normal children do not tolerate clothing and apart from their outward form do not possess the character and soul of the human [2] As recently as 1946 the Gazelle boy of the Near East received much Press publicity and a wealth of circumstantial detail about his phenomenal powers of running and endurance This boy allegedly brought up by a herd of gazelles was later reported to be an escaped mental defective)

Obesity

1118 *Caesar* Let me have men about me that are fat
Sleek headed men and such as sleep o' nights
Yond Cassius has a lean and hungry look
He thinks too much such men are dangerous —*Julius Caesar* i 2

1119 *Gaunt* Watching breeds leanness leanness is all gaunt
The pleasure that some fathers feed upon
Is my strict fast —I mean my children's looks
And therein fasting hast thou made me gaunt —*Richard II* ii 1

1120 *Prince* Why dost thou converse with that trunk of humours,
that bolting hutch of beastliness that swollen
parcel of dropsies that huge bombard of sack that
stuffed cloak bag of guts —*Henry IV* Pt 1 ii 4

1121 *Longaville* The mind shall banquet though the body pine
Fat pranches have lean pates, and dainty bits
Make rich the ribs but bankrupt quite the wits —
Love's Labour's Lost i 1

1122. *Falstaff* a man of my kidney—think of that,—that am as subject to heat
as butter a man of continual dissolution and thaw it was a
miracle to scape suffocation —*Merry Wives of Windsor* iii 5

1123 *Mrs Ford* My maid s aunt the fat woman of Brentford has a gown above.—*Merry Wives of Windsor* iv 2

1124 *Dromio* Nell sir but her name and three quarters that s an ell and three quarters will not measure her from hip to hip

Antipholus Then she bears some breadth ?

Dromio No longer from head to foot than from hip to hip she is spherical like a globe I could find out countries in her —*Comedy of Errors* iii 1

An ell and three quarters is 78¾ inches This is by no means a record. The *Lancet* for 1878 i 297 quotes the case of one William Campbell, who measured 96 inches round the shoulders and 85 round the waist The circumference of his calf was 35 inches and his weight 728 lb

A Miss Conley, an exhibitionist with a more modest weight of 479 lb was smothered in bed as a result of rolling over on to her face and being unable to turn over again *British Medical Journal* 1883 ii 284

Daniel Lambert of Leicester born 1770 was normal until he was 14 At 30 he weighed 739 lb was 108 inches in girth and 36 round the leg

There are numerous other instances quoted by Gould [2] in which the weights are of this order

Occupational Stigmata

1125 *Constance* O upon my knees
Made hard with kneeling I do pray to thee —*King John* iii 1

1126 *Troilus* harsh
As the hard palm of ploughman s —*Troilus and Cressida*, i 1

1127 *Rosalind* I saw her hand she has a leathern hand,
A freestone-coloured hand I verily did think
That her old gloves were on but twas her hands
She has a housewife s hand but that s no matter —
As You Like It iv 3

Oestrus

1128 *Cloten* for tis said a women s fitness comes by fits —*Cymbeline* iv 1

Omens

1129 *Lennox* The night has been unruly where we lay
Our chimneys were blown down and as they say
Lamentings heard i the air strange screams of death
And prophesying with accents terrible
Of dire combustion and confused events
New hatch d to th woeful time the obscure bird
Clamour d the livelong night some say the Earth
Was feverous and did shake —*Macbeth* ii 1

(The obscure bird is the owl Obscure means ill-omened)

1130 *Othello* O it comes o'er my memory
As doth the raven o er th infected house,
Boding to all —*Othello* iv 1

1131 *Cassius* For he is superstitious grown of late
Quite from the main opinion he held once
Of fantasy of dreams, and ceremonies —*Julius Caesar* ii 1

1132 *Calpurnia* Caesar I never stood on ceremonies
Yet now they frighten me There is one within
Besides the things that we have heard and seen
Recounts most horrid sights seen by the watch.
A lioness hath whelped in the streets
And graves have yawned and yielded up their dead
Fierce fiery warriors fought upon the clouds

When beggars die there are no comets seen
The heavens themselves blaze forth the death of princes

Caesar What say the augurers?

Servant They would not have you to stir forth to-day
Plucking the entrails of an offering forth
They could not find a heart within the beast.—*Julius Caesar* ii 2

1133 *Cassius* You know that I held Epicurus strong
And his opinion now I change my mind
And partly credit things that do presage
Coming from Sardis on our foremost ensign
Two mighty eagles fell and there they perched
Gorging and feeding from our soldier's hands
Who to Philippi here consorted us
This morning they are fled away and gone
And in their steads do ravens crows and kites
Fly o'er our heads and downwards look on us
As we were sickly prey their shadows seem
A canopy most fatal under which
Our army lies ready to give up the ghost.—*Julius Caesar* v 1

(The Epicureans a philosophical sect founded by Epicurus 342-270 B C maintained that virtue should be followed as that was the way to happiness. Plutarch says In our sect Brutus we have an opinion that we do not always feel or see that which we suppose we do but we see and feel but that our senses being credulous and therefore easily abused imagine they see and conjecture that which in truth they do not)

1134 *Horatio* A little ere the mightiest Julius fell
The graves stood tenantless and the sheeted dead
Did squeak and gibber in the Roman streets
Stars with trains of fire and dews of blood
Disasters in the Sun and the moist star
Upon whose influence Neptune's empire stands
Was sick almost to doomsday with eclipse
And even the like precurse of fierce events
As harbingers preceding still the fates
And prologue to the omen coming on—
Have Heaven and Earth together demonstrated
Unto our climature and countrymen.—*Hamlet* i 1

1135 *King Richard* Out on ye owls! nothing but songs of death?—
Richard III iv 4

1136 *Benedict* I had as lief have heard the night raven came
what plague could have come after it.—*Much Ado About Nothing* ii 3

1137 *Friar* how oft to night
Laurence Have my old feet stumbled at graves!—*Romeo and Juliet* v 3

(The same omenous interpretation of stumbling is given by Hastings when suddenly and unexpectedly condemned to execution
(Three times to-day my foot-cloth horse did stumble —*Richard III* iii 4)

1138 *Captain* The bay tree in our country all are withered —*Richard II* II 4

(According to Holinshed this strange event occurred in 1399 when throughout all the realme of England old bate trees withered and afterwards constrained to all mens thinking grew greene again —a strange sight and supposed to import some unkind or ill event The phenomenon was perhaps peculiarly significant because the bay tree was not a common tree but was held in especial reverence.

Neyther lolling sycknes neyther devyll wyll infest or hurt one in that place where is a Bay tree is The Romayns called it the plant of the good angell (Langham s Books of Notable Things)

The tree was a bad omen whose appearance presaged death The Elizabethans however were not all so prone to superstitions Joseph Hall 1608 in his Characters of Vertues and Vices is more than scathing

Superstition is godless religion devill impiety It but a bare cross from the way he returns for if he stumble at the threshold If he heare but a raven croak from the top of his roofe he makes his will or if a buttour light over his head by night but of his troubled fancy shall second his thoughts with the death of a fair garden or green rushes or the saluation of a lead friend he takes leave of the world and says he cannot live

And the night raven
Which dull men call
Mortal Death harbinger But good fellow
Is mad pranks and merry jests 1628)

Pain

1139 *Macbeth* The labour we delight in physicians pain —*Macbeth* III 1

1140 *Othello* I have lost my hunger ache my head my sinews
My mother let my limbs members even to the sense
Of pain —*Othello* III 4

[Another hand thus illustrates the fact in the presence of one pain or illness we become aware of some other sensation which otherwise would not reach consciousness Such is a common fact The contrast sensation the pre [illegible] of one pain may obscure the sensation of another This is [illegible] in the usual quotation and in the reflexes to counter irritation]

1141 *Lear* But where the greater malady is fixed
The lesser is scarce felt —*King Lear* III 4

1142 *Henry IV* he was struck
With such an agony he sweat extremely
And something spoke in choler ill and hasty .—*Henry VIII* II 1

Pallor

1143 *Henry IV* And till so much blood thither come again
Richard II Have I not reason to look pale and dead ?—*Richard II* III 2

1144 *Helena* We blush that thou shouldst choose but be refused
Let the white death sit on thy cheek for ever
We will ne er come there again —*All s Well That Ends Well* II 3

1145 *Don Pedro* I shall see thee ere I die look pale with love —
Much Ado About Nothing I 1

1146 *Benedick* With anger with sickness or with hunger my lord
not with love prove that ever I lose more blood with
love than I will get again with drinking pick out
mine eyes with a ballad maker s pen and hang me up at
the door of a brothel house for the sign of blind Cupid —
Much Ado About Nothing I 1

1147 *Don Pedro* As I am an honest man he looks pale Art
thou sick or angry ?—*Much Ado About Nothing* V 1

1148 [illegible] *I* H[illegible] why is your cheek so pale?
How [illegible] the roses there do fade so fast?—
Midsummer Night s Dream [illegible]

1149 *I* [illegible] There [illegible] I rewd contents in yond same paper
That steal th [illegible] from Bassanio s cheek
Some de[illegible] dead [illegible] nothing in the world
Could turn [illegible] so much th [illegible] constitution
Of any constant man [illegible] *Merchant of Venice* iii 2

Palm Sweating of (*See* Hand)

Palpitation

1150 His drumming heart cheers up his burning eye —
Rape of Lucrece line 435

Panic

1151 *Puck* Their senses thus weak lost with their fears thus strong
Made senseless things begin to do them wrong
For borers and thorns at their apparel snatch
Some sleeves—some hats from yielders all things catch
I led them on in this distracted fear—*Midsummer Nights Dream* iii [illegible]

Panting

1152 *Cassio* Make love s quick pants in Desdemona s arms —*Othello* ii 1

1153 *Cominius* and till we call d
Both field and city ours he never stood
To ease his breast with panting—*Coriolanus* ii 2

Paralysis

1154 *First Player* So as a painted tyrant Pyrrhus stood,
And like a neutral to his will and matter
Did nothing—*Hamlet* ii 2

1155 *York* O then how quickly should this arm of mine
Now prisoner to the palsy chastise thee —*Richard II* iii 3

Parasites (*See also* Scabies)

1156 *2nd Carrier* I think this be the most villainous house in all London road
for fleas I am stung like a tench —*Henry IV* Pt 1 ii 1

1157 *2nd Carrier* Why they will allow us ne er a jordan and
then we leak in your chimney and your
chamber he breeds fleas like a loach —*Henry IV* Pt 1 ii 1

(A jordan was an indoor commode a jakes, mentioned elsewhere as outdoor lavatory The Elizabethan house knew nothing of the refinements of the water-closet which form of sanitation had been practised by the Romans The belief is here expressed that stale urine breeds fleas of itself
The reference to the infestation of the tench and loach is explainable by a quotation from Pliny Last of all some fishes there be which of themselves are given to breed fleas and lice)

1158 *Dave* No worse than they are back bitten sir for they
have marvellous foul linen —*Henry IV* Pt 2 v 1

1159 *Mrs Ford* If you find a man there he shall die a flea s death —
Merry Wives of Windsor iv 2

1160 *Bottom* Scratch my head Pease-blossom if my hair do but tickle me
I must scratch —*Midsummer Night s Dream* iv 1

1161 *Thersites* I had rather be a tick in a sheep than such a valiant ignorance.—*Troilus and Cressida* iii 3

1162 *Evans* The dozen white louses do become an old coat well it agrees well passant it is a familiar beast to man and signifies love.—*Merry Wives of Windsor* iv 1

(There is a play of words on lice and louse Epidemics of Plague and Typhus were common in Elizabethan times Disraeli quotes a letter written in the reign of James I and preserved in a family of distinction in which the writer a lady remarks that she carried away from Court some compassions upon her person who must have been inhabitants of that place Typhus fever otherwise known as jail fever ship fever camp fever and the bed disease is transmitted by the louse After the 1577 Assizes at Oxford the two judges the sheriff the under-sheriff six justices of the peace and all the members of the grand jury died The death roll at the University was 300 A remarkable infection occurred at the old Bailey in 1750 in which only those sitting on the left side of the court were affected

According to McArthur s account the Bench at the fatal assize consisted of six persons the Lord Mayor (Sir Samuel Pennant) sat in the middle with Lee the Lord Chief Justice and the Recorder of London on his right on his left was Daniel Lambert an Alderman and Justice On the right of the Court was the London Jury and the Middlesex jury on the left. Of those on the Bench the town on the Lord Mayor s right escaped the Lord Mayor himself Baron Clark Sir Thomas Abney and Sir Daniel Lambert all died None of the jury on the right of the court was affected of the Middlesex jury on the left all died except four and all the under sheriffs barristers and others to the number of over 40 who died principally all were on the left side of the court "— Beyond the Microscope" by K M Smith Penguin Series 1943

This particular outbreak was at the time ascribed to bad ventilation whereas it was probably due to a louse-infested person with typhus sitting or moving about in contact with those on that side of the court which suffered)

PARKINSONISM

1163 *Lucula* I know you by the waggling of your head

Antonio To tell you true I counterfeit him

Lucula You could never do him so ill well unless you were the very man Here s his dry hand up and down —*Much Ado About Nothing* ii 1

(Up and down had the contemporary meaning of precise or exactly in this extract signifying in the very manner The expression could however be loosely applied to the rhythmical tremor of Parkinson s disease The association of old age and a dry palm has been previously noted)

1164 *Titus* A better head her glorious body fits Than his that shake for age and feebleness.—*Titus Andronicus* v 1

Bucknill is at fault when he dismisses this play with the single sentence ' Titus Andronicus is the only one of Shakespeare s which contains no passages referring to medical subjects

It is true nevertheless that there are few such allusions and those of little clinical penetration This paucity can be brought forward as an additional argument to support those who maintain that the play was not written except for minor alterations and additions by Shakespeare It has been ascribed to Marlowe The earliest known edition is dated 1600 but there is an entry in the Stationer s Register which mentions a play of this title in 1594 At this time being then some 30 years old Shakespeare had written several plays the medical allusions in which are so numerous that considerable doubt must arise from their comparative absence in Titus as to whether he had any appreciable part in the writing of this play

1165 *Say* These cheeks are pale for watching for your good
Long sitting to determine poor men's causes
Hath made me full of sickness and diseases
It is the palsy and not fear provokes me

Cade Nay he nods at us as who should say I'll be even with you
I'll see if his head will stand steadier on a pole or no —
Henry VI [illegible]

Pathology

1166 *Clown* Nay I'll never believe a madman till I see his brains —
Twelfth Night [illegible]

1167 *Caesar* What say the augerers?
Servant They would not have you stir forth to day
Plucking the entrails of an offering forth
They could not find a heart within the beast — *Julius Caesar* [illegible]

1168 *Lear* Then let them anatomize Regan see what breeds about her heart
Is there any cause in Nature that makes these hard hearts? —
King Lear [illegible]

Pathology is the study of the causes of disease and the way in which the body is affected and altered by disease. Such a study regarded as of primary importance today necessarily involves the examination of the body after death. Anatomy is the study of the normal body in health physiology the way in which the body structures function.

It is surprising to find on reading the history of medicine that pathology as a separate subject never really appears until near recent times and the development of the microscope. Such pathological knowledge as was gathered appeared as it were incidentally. There were innumerable anatomists dissection of the body having been carried out from ancient times but the stress has been on the structure of the normal. The revival of medical investigation with a growing dependence on facts and observation rather than on theorizing began about the seventeenth century. Prior to this time the opinions of the older writers were still held. Both Shakespeare and Molière mention the adherence to the tenets of Galen.

The opinions of the ancient writers are indicated by Celsus who in his opening book of *De Re Medica* discusses the nature of medical practice.

> And it is from this same author (i.e. Homer) that we learn that diseases were related to the anger of the immortal Gods. At first the knowledge of the healing art was considered a part of philosophy. And because the chief dispute in this is that some contend that a knowledge of experiments only is necessary others say that practice only is not sufficient unless the nature of bodies and things be known. Those then who profess theoretical medicine maintain that the following are necessary a knowledge of the hidden causes of disease then of the apparent then of the natural functions and the internal parts. Frequently new kinds of diseases occur in which previous experience is of no help hence it is then necessary to determine how they originated otherwise it is impossible to decide what one should employ this remedy rather than that. Further as pains and various kinds of illness arise in the interior parts of the body they think that those ignorant of the internal appearances cannot justifiably treat such. Therefore it is necessary to dissect dead bodies and examine their viscera and intestines and that Herophilus

and Erasistratus adopted the best method when they cut open living criminals supplied to them by kings out of prison and examined them while life still remained observing those structures which before had been concealed noting the position colour figure size order hardness softness smoothness and general feel of them On the other hand those who call themselves empirics from their experience agree that some cause must be at work but argue that an investigation into such remote causes and natural functions is pointless as the workings of nature must necessarily be beyond understanding Also that the causes are frequently obvious as in a case of soreness of the eyes or a wound but the appropriate cure is not indicated by such knowledge

Such dissection as was undertaken in the Middle Ages was then anatomical rather than pathological in its inquiry The proceedings were not confined to bona fide students as Pepys tells

27th Feb 1663 About 11 o clock Commissioner Pett and I walked to Chyrurgeon s Hall (we being all invited thither and promised to dine there) where we were led into the Theatre and by and by comes the reader Dr Tearne with the Master and Company in a very handsome manner and all being settled he began his lecture and his discourse being ended we had a fine dinner and good learned company many Doctors of Physique and we used with extraordinary great respect Among other observables we drunk the King s health out of a gill cup given by king Henry VIII to this Company with bells hanging at it which every man is to ring by shaking after he hath drunk up the whole cup Dr Scarborough told some of his friends and I went with them to see the body of a lusty fellow a seaman that was hanged for a robbery But all the Doctors at table conclude that there is no pain at all in hanging for that it do stop the circulation of the blood and so stops all sense and motion in an instant

11th May 1663 the other day Dr Clarke and he did dissect two bodies a man and a woman before the King with which the King was highly pleased

Pensioners

1169 *Boult* What would you have me do ? go to the wars would you ?
where a man may serve seven years for the loss of a leg
and have not money in the end to buy him a wooden one ?—
Pericles iv 6

Perfume

1170 *Apemantus* Thy flatterers yet wear silk drink wine lie soft
Hug their diseased perfumes and have longest
That ever Timon was —*Timon of Athens* iv 3

1171 *Cassio* Tis such another fitchew ! marry a perfumed one —*Othello* iv 1

(Both quotations refer to the excessive use of perfumes in harlotry The manufacture of perfumes was part of the day s work of the Elizabethan housewife

The English housewife containing the inward and outward vertues which ought to be in a compleat woman As her skill in Physick Chirurgery Cookery extraction of oils banquetting stuffs ordering of great feasts preserving of all sorts of wines concerted secrets distillations of perfumes ordering of wool hemp or flax making cloth and dying the knowledge of dames the office of malting of oats their excellent uses in families of brewing baking and all other things belonging to a housekeeper runs the title page of Gervase Markham s English Housewife 1631)

1172 *Host* What say you to young Master Fenton ? he capers he dances
he has eyes of youth he smells April and May —
Merry Wives of Windsor iii 3

1173 *[illegible]* Come [illegible] cannot cog and say thou art this and that
like a man of these lisping hawthorn buds that come
like women in men's apparel and smile like bucklersbury
in simple time —*Merry Wives of Windsor* iii 3

[illegible] Bucklersbury was the street of the grocers and the apothecaries It is said [illegible] to Stowe that it was due to one Buckle a grocer who pulled down [illegible] the building called the Crutch in war time in order to rebuild on the site Part of the [illegible] fell on him shortening his life His widow remarried and set up a business in the street Muffet in his "Treatise of Meats" says that the plague rarely affected Bucklersbury since it was so highly perfumed with drugs [illegible] and spices —Shakespeare's Wild Flowers" by E S Rohde)

Pestilence (*See* Plague Poison Infection)

Pharmacy

1174 *Holofernes* Twice sod simplicity his coctus —*Love's Labour's Lost* iv 2

(A technical term of Pharmacy Holofernes is constantly breaking into Latin appropriately so being a schoolmaster and elsewhere uses the term in a matter)

Philosophy

1175 *Hamlet* There are more things in Heaven and Earth Horatio
Than are dreamt of in your philosophy —*Hamlet* i 5

Physic

1176 *Macbeth* Throw physic to the dogs I'll none of it —*Macbeth* v 3

1177 *Maria* I knew my physic will work with him —*Twelfth Night* ii 3

1178 *Hamlet* This physic but prolongs thy sickly days —*Hamlet* iii 3.

1179 *Lear* Take physic pompe —*King Lear* iii 4

1180 *Prince* If he be sick
With joy he will recover without physic —*Henry IV* Pt 2 iv 5

Physician

1181 *Roderigo* And then we have a prescription to die when death is
our physician —*Othello* i 3

1182 *Kent* Kill the physician and the fee bestow
Upon the foul disease —*King Lear* i 1

1183 *Sempronius* His friends like physicians thrice give him over
must I take the cure upon me ?—*Timon of Athens* iii 5

1184 *Timon* trust not the physician
His antidotes are poison and he slays
More than you rid —*Timon of Athens* iv 3

1185 *Alcibiades* make each
Prescribe to other as each other's leech —*Timon of Athens* v 4

1186 *King Richard* Now put it God in his physician's mind
To help him to his grave immediately —*Richard II* v 4

1187 *Cranmer* 'Tis Butts
The King's physician —*Henry VIII* v 2

1188 *Cymbeline* Whom worse than a physician
Would this report become ? But I consider
By medicine life may be prolonged yet death
Will seize the doctor too —*Cymbeline* v 5

1189 *Antipholus* They brought one Pinch a hungry lean faced villain
A mere anatomy a mountebank
A threadbare juggler and a fortune-teller
A needy hollow eyed sharp looking wretch
A living-dead man this pernicious slave
Forsooth, took on him as a conjurer
And gazing in mine eyes feeling my pulse
And with no face as twere outfacing me
Cries out it was possessed Then all together
They fell upon me bound me bore me thence
And in a dark and dankish vault at home
They left me and my man both bound together —
Comedy of Errors v 1

1190 *Gaunt* And thou too careless patient as thou art
Committest thy anointed body to the cure
Of those physicians that first wounded thee —*Richard II* ii 1

1191 *Pericles* Thou speak st like a physician Helicanus
That minister st a potion unto me
That thou wouldst tremble to receive thyself —*Pericles* i 2

1192 *Lafeu* He hath abandoned his physicians madam under
whose practices he hath persecuted time with hope
and finds no other advantage in the process but only
the losing of hope by time — *All s Well That Ends Well* i 1

1193 *King* How long is it count
Since the physician at your father s died ?
He was much famed
If he were living I would try him yet —
Lend me an arm —the rest have worn me out
With several applications nature and sickness
Debate it at their leisure — *All s Well That Ends Well* i 2

1194 *King* We thank you maiden
But may not be so credulous of cure
When our most learned doctors leave us and
The congregated college have concluded
That labouring art can never ransom nature
From her inaidable estate —I say we must not
So stain our judgement or corrupt our hope
To prostitute our past cure malady
To empirics or to dissever so
Our great self and our credit to esteem
A senseless help when help past sense we deem —
All s Well That Ends Well ii 1

1195 *Lafeu* To be relinquished of the artists —both of Galen and Paracelsus
of all the learned and authentic fellows —that gave him out
incurable —not to be help d —*All s Well That Ends Well* ii 3

1196 The patient dies while the physician sleeps —
Rape of Lucrece line 904

1197 *Shallow* He is the wiser man master doctor he is a curer of
souls and you a curer of bodies.—*Merry Wives of Windsor* iii 3

1198 *Countess* But thank you, Helen
If [illegible] and tender your supposed aid
Ha[illegible] receive it? he and his physicians
Are [illegible] he that they cannot help him
They [illegible] they cannot help how shall they credit
A poor unlettered virgin when the schools
Embowelled of their doctrine have left off
The danger to itself —*All's Well That Ends Well* [illegible]

1199 *Host* What says my Aesculapius? my Galen? my heart of elder? ha! is he dead, bully Stale? is he dead?
Thou art a Castiliian King Urinal! Hector of Greece, my boy!
Mock water —*Merry Wives of Windsor* [illegible]

(The host is picking fun at Dr Caius in this scene, the latter having an imperfect understanding of English words and their meanings
Stale refers to urine
Doest thou think the stale of horses? [illegible] *and Cleopatra* Mock water and Urinal are slighting references to the practice of Uroscopy
There are other references to the elder tree that in *Love's Labour's Lost* referring to Judas Iscariot
Judas was hanged on an elder
The second refers to the use made by children of the elder pith that [illegible] pith
That's a perilous shot out of an elder gun —*Henry* [illegible]
Of the medicinal virtue of the elder Gerard says The [illegible] with the berries thereof are good for such as have the Dropsie [illegible] are to [illegible] and would fame be leaner if they be taken [illegible] the quantities of a dram with wine for a certain space)

1200 *Page* I think you know him Master Doctor Caius the renowned French physician
Evans He has no more knowledge in Hibbocrates and Galen —and he is a knave besides —*Merry Wives of Windsor* [illegible]

(Bucknill [illegible] says that it was been supposed by some that the Dr Caius of the play was intended to represent Sir Thomas Moyern a French physician who became famous in the English practice He settled in London in 1611 and became physician to James I who knighted him
He edited the first edition of the Pharmacopoeia of the College of Physicians and although some of his preparations contain such ingredients as powdered human skull the blood of weasels and balsam of bats
to quote Gilthes History of Medicine
There was a contemporary Dr Caius the founder of Caius College Cambridge 1510 1573 born in Norwich He was physician to the court of Henry VIII Edward VI Mary Queen and Elizabeth
There are no grounds for identifying Dr Caius with any real individual He is made a figure of fun in the play not because of his calling but owing to his mixture of English and French characteristics Shakespeare does not ridicule the practice of medicine or its institutions Such medical characters as do appear have only minor parts incidental rather than essential to the action It is interesting to contrast the treatment of Molière who had little use for the faculty and whose play generally tend to expose the follies of the time There is no such apparent campaigning in the Shakespearean plays

1201 *Host* Shall I lose my doctor? no he gives me the potions and the motions —*Merry Wives of Windsor* [illegible]

1202 *Quickly* Nay said I will you cast away your child on a fool and a physician? —*Merry Wives of Windsor* [illegible]

Physiognomy

1203 *Duncan* There is no art
To find the mind's construction in the face —*Macbeth* [illegible]

1204 *Lady Macbeth* Your face my thane is as a book where men
May read strange matters —*Macbeth* [illegible]

1205 *Macbeth* False face must hide what the false heart doth know —
Macbeth i 7

1206 *Macbeth* And make our faces visards to our hearts
Disguising what they are —*Macbeth* iii 2

1207 *Bastard* Fair fall the bones that took the pains for me !—
Compare our faces and be judge yourself —*King John* i 1

1208 *Elinor* He hath a trick of Cœur de-lion's face
The accent of his tongue affecteth him
Do you not read some tokens of my son
In the large composition of this man ?—*King John* i 1

1209 *Cleopatra* Bear st thou her face in mind ? is it long or round ?
Messenger Round even to faultiness
Cleopatra For the most part too that re foolish that are so —
Antony and Cleopatra iii 3

(A contemporary opinion So in Hill s Pleasant History —
" The head very round to be forgetful and foolish
The head long to be prudent and wary)

1210 *Caliban.* And all be turn d to barnacles or to apes
With foreheads villainous low —*Tempest* iv 1

1211 *Julia.* Her eyes are grey as glass and so are mine
Ay but her forehead s low and mine s as high —
Merry Wives of Windsor iv 2

(Her roseate forehead full of bounte brave
Like a broad table did itselle d spread
Spenser s Faerie Queene
Opinion could scarcely do otherwise than admire the high broad forehead
in Elizabethan times in view of this striking feature in Elizabeth herself)

There are three different conceptions in the above quotations Firstly the reaction of the expression to emotion secondly the mental and moral tendencies associated with certain anatomical features and lastly the inheritance of anatomical characteristics

The belief that anatomical features are associated with certain mental tendencies was the fundamental assertion of Gall (1758–1828) who thus started the so called science of Phrenology It was the Italian Lombroso alienist and forensic expert who in the latter half of the last century carried out a scientific survey covering lunatics and criminals

Disraeli in his Curiosities of Literature relates that Louis XIV 1638–1715 regularly consulted his physiognomist De La Chambre before selecting his officers and favourites James I likewise consulted the Earl of Pembroke whose hobby it was on the arrival of foreign ambassadors at court

A Dr Gwither writing in 1604 says in effect that the continued use of facial muscles in emotional expression produces a permanent alteration of the features from which may be deduced their emotional reactions He quotes the case of the chronic alcoholic having an internal squint as a result of long continued squinting into the tankard at his mouth !

The great Prince of Conde 1621 1686 says Disraeli was very expert in a sort of physiognomy which showed the peculiar habits motions and postures of familiar life and mechanical employments He would sometimes

lay wagers with his friends, that he would guess, upon the Pont-Neuf what trade persons were of that passed by from their walk and air.

It was precisely this type of clinical observation which was taught by Dr. Joseph Bell, 1837–1911, whose pupil Sir Arthur Conan Doyle has immortalized the method in his character Sherlock Holmes.

PINEAL GLAND ?

1212 *Hamlet* In my mind's eye, Horatio.—*Hamlet*, i. 2.
(Descartes, 1596–1650, described the pineal gland as the seat of the soul.)

PINING

1213 *King Richard* To to Flint-castle: there I'll pine away.—*Richard II*, iii. 2.

1214 *Brutus* If he love Caesar, all that he can do
Is to himself: take thought and die for Caesar.—*Julius Caesar*, ii. 1.

1215 *Cymbeline* Nay, let her languish
A drop of blood a day; and being aged
Die of this folly!—*Cymbeline*, i. 1.

(*See also* SIGHING)

PLAGUE

1216 *Timon* Plagues incident to men
Your potent and infectious fevers heap
On Athens.—*Timon of Athens*, iv. 1.

1217 *Timon* Be as a planetary plague, when Jove
Will o'er some high-viced city hang his poison
In the sick air.—*Timon of Athens*, iv. 3.

1218 *Timon* The saints for aye
Be crown'd with plagues.—*Timon of Athens*, v. 1.
(Timon's mind is running on the effects of syphilis and the demoralizing effect of riches. I think this is a further reference to the corona venerealis to which there are repeated references. See SYPHILIS.)

1219 *Gaunt* Devouring pestilence hangs in our air
And thou art flying to a fresher clime.—*Richard II*, i. 3.

1220 *Biron* Write, Lord have mercy on us, on those three;
They are infected; in their hearts it lies;
They have the plague, and caught it of your eyes.
These lords are visited; you are not free;
For the Lord's tokens on you do I see.—*Love's Labour's Lost*, v. 2.
(Biron is using the language of the plague to suggest that his companions are love-sick; hence the catching of your eyes.
The Lord's tokens was the name given to the skin manifestations of bubonic plague.)

Pepys [11] writes on 7th June 1665: "The hottest day that ever I felt in my life. This day much against my will, I did in Drury Lane see two or three houses marked with a red cross upon the doors and 'Lord have mercy on us,' writ there; which was a sad sight to me, being the first of the kind that to my remembrance I ever saw."

Defoe, better known for his story of Robinson Crusoe, wrote "The Journal of the Plague Year," although he himself was only five years old

in 1665 He says that the doctors went about prescribing to others till the tokens were upon them and they dropped down dead"

Stow in his "Survey of London talking about watches and other Matters says that it was the custom to build bonfires in the streets on the vigil of festival days and on the evening of the festivals and also for the virtues that a great fire hath to purge the infection of the air Illustrating the same belief we find in Pepys that on the 6th September 1665 To London to pack up more things and there I saw fires burning in the streets, as it is through the whole city by the Lord Mayor's order '

There was no idea at the time that the rats were primarily the source of the infection Dogs were suspected and accordingly the rat catchers were employed in rounding up the dogs It was universally held that the infection was in the air Various remedies were adopted no doubt each having a favourite of their own Dr Nathaniel Hodges 1629–1688 has left the clinical account of the great plague in his Loimologia, being one of the doctors who stayed behind and did not fly to the country As a prophylactic measure he took an anti plague electuary each morning and had a fumigation carried out before entering the sick rooms He sucked lozenges of myrrh cinnamon and angelica and placed no little reliance on his daily glasses of sack Angelica had been recommended in The English Huswife 1615 There was an official plague water in the pharmacopeia

July 20th 1665 My Lady Carteret did this day give me a bottle of plague water home with me"—*Pepys*

There was a general exodus from London which included unfortunately for medical posterity that accurate clinical observer Dr Thomas Sydenham who no doubt otherwise would have contributed a record of more value So many people either died or left London that Pepys records that grass grows all up and down White Hall ' and that what a sad time it is to see no boats upon the river

Out of a population of 500 000 it has been estimated some 100 000 perished

The plague of 1665 was the last epidemic outbreak although sporadic cases occurred afterwards There had been many smaller epidemics previously in London particularly during the hot summers It is interesting to note that Fitzstephen in Henry II's time says that the only inconveniences in London are ' the immoderate drinking of foolish persons and the frequent fires The treatments tried by Hodges included unicorn's horn and dried toad powder Gervase Markham has

> But if you be infected with the plague and feel the assured signs thereof as pain in the head drought burning weakness of stomach and such like then you shall take a drachm of the best mithridate and dissolve it in three or four spoonsful of dragon water and immediately drink it off and then with hot cloths or bricks made extreme hot and laid to the soles of your feet after you have been wrapt in woollen cloths compel the sick party to sweat which if he do keep him moderately therein till the sore begin to rise then to the same apply a live pigeon cut in two parts or else a plaster made of the yelk of an egg honey herb of grace chopped exceeding small and wheat flour which in short space will not only ripen but also break the same without any other incision then after it hath run a day or two you shall apply a plaster of melilot unto it until it be whole

Out of the most interesting clinical accounts of the Plague of London written at the time was that of William Boghurst an apothecary 'Lomographia 1666

> Of all the common backney prostitutes of Litten Lane Dog Yard Cross Lane Baldwin s Gardens and other places the common drivers of Oranges Oysters Fruite etc all the impudent drunken drabbing Bayles and fellowes and team others of the Rouge Route there is but few missing Verifying the testimony of Dernerbrooke that the plague left the rotten bodyes and took the sound
>
> Now because I will not be too tedious about these accidents about what and whence the plague arisith but rather to passe on to those things more certaine and necessary I will only sett downe a catalogue of these many hitherto Peceadilloes which hitherto by most people and Physitians in the world have been reckoned for absolute causes of the plagee which the most of them at least can see but only furthering occasions not originall causes and they are such as these viz thickness of inhabitants thirst living as many families in a house living in cellars want of fitting accommodations as good fires good dyett washing want of good cleanyeness of filth standing and stinking waters dunghills excrements dead bodies lying unburied and petrifying churchyards too fell enclosed unseasonable weather soeth and east winds much drying weather mixing together over watching the body overcharging the body with nourishments hott and moyst constitutions overheating the body with too much venery increase of vermin as Frogs toades Spiders Mice Flies worries beggs serpents Bruts ants butter flyes etc Ferring and stopping up of conveyances as Channels Pypes gutters want of scouring ditches and pooles vaults Fens and Marshes hempe flax asphaltem and sweet herbes steeped long in standing waters expiring but of putrifyed lakes and nasty Denns and Dengeons venomous herbes petrifying above the ground fumes of metalls and minerralls Arsenick quicksilver orpiment or antimony (But I am much mistaken if these emit of themselves any fumes at all) feeding on rotten meate mouldy bread malevolent aspects and mixture of the Planets Eclipses of the Luminaries corruption of humors transportation of infected goods from place to place breaking up tombs and graves wherein dead bodyes have been long berved and crowded together (yet this is not very likely to bee true for when the Charnel House at St Pauls was demolished there was a thousand cartloads of dead mens bones carried away to Finsbery yet no plague followed it) I have alwaies thought the Plagee is a most subtile peculiar insinuating venomous deleterious Exhalation arising from the putrefaction of the ferment of the Faeces of the Earth extracted into the Aire by the heat of the sun and diffused from place to place by the winds and most times gradually but sometymes immediately ingressing apt bodyes

Defoe's Journal of the Plague though purporting to be an eye-witness account was in fact written in 1722 Defoe himself could have had no personal memories being only a child at the time of the epidemic Nevertheless his account is a factual document obviously being based on contemporary writings neither was it very remote in time It gives a general picture of the problems faced by population, describes the measures taken such as the lighting of bonfires the searchers the marking of the houses the burial carts the difficulties in parish administration the acute nature of the infections and many points not clinical The bills of mortality are quoted and critically analysed No better introduction to the study of the Plague could be read than this work of Defoe s The view that Plague arose as a result of soil poisoning was held by Creighton (History of Epidemics 1891) who con-

sidered, as did many earlier writers, that the poison originated from corpses. He quotes many references in which the mortality amongst rats is mentioned during plague epidemics, but assumed that such arose from the fact that rats were poisoned by the exhalation from the soil. The organism responsible for bubonic plague was determined some three years after Creighton wrote in 1894.

1221 *Caliban* — The red plague rid you
For learning me your language!—*Tempest*, I. 2.

1222 *Thersites* — a red murrain o' thy jades' tricks!—*Troilus and Cressida*, II. 1.

1223 *Volumnia* — Now the red pestilence strike all trades in Rome
And occupations perish.—*Coriolanus*, IV. 1.

(Fletcher of Physicke, 1605. "Three different kinds of plagee sore are mentioned: sometimes it is red, otherwhiles yellow and sometimes blacke, which is the very worst and most veanimous." Halliwell, on the above book in Buckell [3].)

1224 *Friar John* — Going to find a barefoot brother out
One of our order, to associate me
Here in this city visiting the sick
And finding him, the searchers of the town
Suspecting that we both were in a house
Where the infectious pestilence did reign
Seal'd up the doors, and would not let us forth
So that my speed to Mantua there was stay'd.

Friar Laurence — Who bare my letter then to Romeo?

Friar John — I could not send it—here it is again.—

Friar John — Not get a messenger to bring it thee
So fearful were they of infection.—*Romeo and Juliet*, V. 2.

(Samuel Pepys:
"And I could not get my wife to go elsewhere for fear of the plague. And Mr. Lord Mayor commands people to be within at nine at night, all as this say, that the sick may have liberty to go abroad for ayr. I by water to Charing Cross, to the pest house, and there the people tell me they are shut up, and so I went to the new pest house and there get a gelding and horses to Hounslow. And they tell me that at Westminster there is never a physitian and but one apothecary left all being dead." Meeting, yesterday the searchers with their rods in their hand, coming from Captain [illegible]'s house, I did overhear them say that in Black Hill in the end of the plague.
"[illegible] were empowered to visit the houses with suspected plagee [illegible] the sick and shut up the house if plague were diagnosed.")

1225 [illegible] — On our side like the tokened pestilence
Where death is sure.—*Antony and Cleopatra*, III. 10.

1226 [illegible] — How so plaguy proud that the death tokens of it
Cry "No recovery."—*Troilus and Cressida*, II. 3.

1227 [illegible] — Why, how know you that I am in love?

[illegible] — Marry, by these special marks: first, you have learn'd
like Sir Proteus, to wreathe your arms, like a malcontent; to relish a love song, like a robin redbreast; to walk alone, like one that had the pestilence; to sigh, like a schoolboy that had lost his grammar; to love, like one that takes the diet.—*Two Gentlemen of Verona*, II. 1.

Planetary Influences

1228 [illegible] — As if some planet had unwitted men.—*Othello*, II. 3.

1229 [illegible] — This is the excellent foppery of the world, that, when we make guilty of our disasters the Sun, the Moon, and the stars, as if we were

[illegible] lords liars and adulterers by an enforced obedience of planetary influence and all that we are evil on by a divine thrusting on An admirable evasion of whoremaster man To lay his goatish disposition to the charge of a star My father compounded with my mother under the dragon's tail and my nativity was under Ursa Major so that it follows I am rough and lecherous Tut I should have been that I am had the maidenliest star in the firmament twinkled on my bastardising —*King Lear* I 2

(An eclipse of the sun took place in October 1605 and of the Moon a month earlier There is a remark by Gloster in Act I Scene 2 presumably referring to this event which has helped to date the writing of the play The exposure of the Gunpowder Plot occurred in November 1605 the which was held by the believers to have been connected astrologically speaking with the eclipses Although such astrological beliefs were widespread in Elizabethan times and moreover were held by the learned as well as the supposedly more credulous there were those who doubted or disbelieved A John Harvey had written against the beliefs in 1588 Even the famous Richard Mead 1673 1754 wrote a Treatise on the influence of the Sun and Moon on the human body whilst Ambrose Paré is also to be listed as a believer On the assumption that the above quotation represents Shakespeare's own view he must be allowed a place against the early critics of astrology)

1230 *Edmund* O these eclipses do portend these divisions !
I am thinking brother of a prediction I read this other day what should follow these eclipses

Edgar Do you busy yourself with that ?

Edmund I promise you the effects he writes of succeed unhappily

Edgar How long have you been a sectary astronomical ?—*King Lear* I 2

1231 *Edgar* Bless thee from whirlwinds star blasting and taking —*King Lear* III 4

1232 *Kent* The stars above us govern our conditions —*King Lear* III 4

1233 *Prologue to Romeo and Juliet*
A pair of star-crossed lovers take their life

1234 *Ulysses* And therefore is the glorious planet Sol
In noble eminence enthroned and sphered
Amidst the other whose medicinable eye
Corrects the ill aspects of planets evil
And posts like the commandment of a king,
Sans check To good and bad but when the planets
In evil mixture To disorder wander
What plagues and what portents what mutiny
What raging of the sea shaking of earth,
Commotion in the winds frights changes horrors
Divert and crack rend and deracinate
The unity and married calm of states
Quite from their fixture !—*Troilus and Cressida* I 3

(Troilus and Cressida was founded on the story in Homer's Iliad an English edition which Chaucer and [illegible] available to Shakespeare before the Register was, I think, play in 1609 In Book I Homer describes the Greek forces being the subjects of a plague due to the showering of plague-darts by Jove

Our everyday language still uses the terms of astrology now without specific meaning but some meaning precisely what the words indicate This is your lucky day This bodes well for the future more unlucky star gazing lunatic born under a lucky star and the like From a perusal of the popular periodicals it would appear that the cult of astrology still flourishes Indeed it will be difficult for a mountain of the future correctly to decide whether or not the twentieth century follows the cult out of an element of belief)

(*To be continued*)

Clinical Notes and Cases

TWO CASES OF COMMON BILE DUCT OBSTRUCTION

BY

Surgeon Commander D D STEELE-PERKINS, R N

THE problem of common duct obstruction usually resolves itself into a diagnosis of common duct stone or periampullary neoplastic disease The opportunities of seeing or treating this type of case are comparatively uncommon in the Service so that when two cases occurred together within a short time of each other, it was considered of sufficient interest to put them on record particularly as one was caused by a relatively silent duodenal ulcer

Common duct obstruction due to progressive ulcer disease has been well recognized but is unquestionably one of the least commonly encountered causes of obstructive jaundice

Case I—Lieutenant R N (Rtd) aged 57 This patient was admitted to a naval hospital on 26 12 53 following a severe hæmatemesis and melena Barium meal and swallow at this time showed no evidence of œsophageal varices or peptic ulceration and with rest and the appropriate diet he apparently recovered completely

At the beginning of October 1954 he felt unwell lost his appetite and developed dark coloured urine On 5 11 54 he was admitted to the medical section of the hospital again complaining of general malaise sweating loss of appetite increasing jaundice clay-coloured stools and itching of his skin He also complained of an aching pain in the right lower chest which radiated to his back

Clinical examination on admission showed definite jaundice His blood pressure was 160 110 with arteriosclerotic changes In his abdomen there was some resistance and tenderness in his epigastrium There was a left inguinal hernia He was also found to have glycosuria which proved to be of a mild degree due to a previously undiagnosed diabetes mellitus

Fasting blood sugar was 153 mg per cent
Hæmoglobin 100 per cent
Urobilinogen increased
Faeces—no bile present
Van den Bergh—Bilirubin 10 5 mg per cent Thymol turbidity 8 units Serum protein 7 2 grammes per cent Alkaline phosphatase 45 Lovibond units

Chest x ray showed a prominent aortic knuckle and a somewhat raised and domed diaphragm on the right. A further Barium swallow and meal now showed appearances suggestive of varices at the lower end of the œsophagus and the duodenal cap was slightly irregular There were no other signs of portal back pressure

On 10th November he had a further frank hæmatemesis and passed a number of melænic stools His hæmoglobin fell to 83 per cent His jaundice which previously had been increasing began to diminish after this last hæmatemesis At this stage he was seen by the Consulting Physician to the Royal Navy who considered laparotomy would

be indicated [illegible] in view of the apparent improvement in his condition [illegible] discharge

Further Investigations Haemoglobin 91 5 per cent. Prothrombin index 62 per cent of normal Van den Bergh Positive direct reaction Indirect Bilirubin 3 mg per cent Blood Serum amylase 133 units per 100 ml Serum protein 7 5 grammes per cent Thymol turbidity 3 units Alkaline phosphatase 30 Lovibond units

Unfortunately at this stage the patient developed a severe cold and bronchitis and laparotomy had to be postponed until 8 12 54 Prior to operation he was put on soluble insulin and vitamin K In the meantime an intravenous cholecystogram was undertaken which showed poor function of the gall bladder

At laparotomy through a right upper muscle splitting paramedian incision the abdomen was opened There was a large thickened and distended gall bladder and a large ulcer embracing the whole of the posterior and inferior wall of the first part of the duodenum The pancreas was found to be enlarged hard and nodular throughout The common duct was opened and a No 6 bougie, the largest size that would pass behind the ulcer had passed into the duodenum—no calculus was present in the common duct A T tube was placed in the duct with long end down to the sphincter and an attempt was then made to mobilize the first part of the duodenum It soon became evident that this was a hazardous procedure as in addition to the common duct the hepatic artery was also involved in the penetrating bed of the ulcer Pendectomy was therefore performed (Barcroft's closure) and an Antecubital Polya Gastrectomy completed the operation A drain was put down to the stump of the pylorus and brought out with the T tube in the right flank The gall bladder which was grossly diseased was removed

On 18 12 54 before removal of the T tube a cholangiogram with iodiol was performed which showed that the ducts were patent

The patient made a normal recovery

Case 11—Stoker Pensioner aged 61 This patient was admitted to the medical section of a naval hospital on 9 8 54 with a history of diarrhoea following a pain in the back which had commenced about three weeks previously He had enjoyed good health all his life and had never had any jaundice or dyspeptic symptoms

On examination he was found to be deeply jaundiced but in no distress whatever Blood pressure 130/70 Chest X ray normal On examination of his abdomen there was found to be a grossly enlarged hard liver and in easily palpable soft rounded swelling in the right iliac fossa which was assumed to be a distended gall bladder

While resting his general condition improved and his appetite returned but his jaundice remained unchanged

Investigations—Blood Icterus index 150 Lovibond units

Van den Bergh Direct Positive Immediate

Fractional test meal showed a complete achlorhydria.

Barium Meal No new growth demonstrated in stomach Stomach is hypotonic and gives the impression of being pushed over to the left away from G B—under arch Duodenal cap is normal but there is flooding of the rest of the duodenum and it is difficult to distinguish the different parts No obvious widening of the duodenal loop but again there is the impression of extrinsic pressure from above and behind No delay in emptying time of stomach

Straight X ray of Abdomen No abnormality

Capillary Blood Cell Count		*Differential White Cell Count*	*Per cent*	*Per c mm*
R B C s per c mm	4 560 000	Polymorphs	56	4 920
Leucocytes per c mm	7 900	Eosinophiles	3	21
Haemoglobin	91 5 (13 5G)	Basophiles	—	—
Colour Index	1 0	Lymphocytes	36	2 520
		Monocytes	5	350

He was transferred to the Surgical Section for [illegible] 17 8 54 [illegible] a low right paramedian incision a greatly enlarged liver [illegible] with a distended gall bladder pointing below into the right iliac fossa There was a little free fluid present The common bile duct was enormously distended—a full inch in diameter Glands were palpable on the left side of the portal fissure but at the region of the common duct termination was what at first felt like a calculus the size of a walnut The common duct was then explored and revealed a complete stenosis of the terminal portion through which even the finest probe would not pass The second part of the duodenum was opened and inspected and an attempt to pass a probe from below also failed The duct was then dissected free and anastomosed over a T tube to the opening in the second part of the duodenum which was mobilized and came up easily without tension A small portion of the tumour was removed for biopsy

The patient made a quite good recovery and was eventually discharged to sick leave

The biopsy revealed a duct carcinoma of the pancreas

On 9 11 54 the patient was readmitted with signs of pyloric obstruction On 23 11 54 his abdomen was again opened through a left paramedian incision and a gastrojejunostomy was performed By this time the whole of the right side of the abdomen was involved in secondary disease The patient made a satisfactory recovery His obstructive symptoms disappeared and he was able to enjoy his meals once again and return to his own home

He was readmitted on 9 3 55 following a sudden deterioration in his condition He was still eating well and there were no signs of gastric obstruction The mass in his abdomen had increased in size There was free fluid present but no jaundice He was dyspnoic and had developed a productive cough He suddenly died during the night after readmission

At the time of his first operation the question of a pancreatectomy was considered but in view of the presumed damage to his liver and the enlarged glands in the portal fissure it was considered that palliative surgery offered him the best chance of a limited survival

My thanks are due to Surgeon Rear Admiral R W Mussen *C B C B.E*, Q H P for his kind permission to publish the clinical notes on these two cases

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A SUSPECTED CASE OF GUILLAIN-BARRÉ SYNDROME

BY

Surgeon Commander H. J. BENNETT, R N.

On Christmas Day 1954 a young Lance Corporal W R A C aged 19 single nulliparous was admitted to hospital following a three-day history of coryza tracheal cough and malaise culminating in a bout of vomiting which precipitated her admission

She presented as a pale sick girl with a brown furred tongue marked fetor oris slight pyrexia and nothing else abnormal on general physical examination The following day her mouth and lips were dry with extensive sordes there was abundant thick mucopurulent post nasal discharge and further vomiting assumed to be due to a gastritis from ingestion of the post nasal drip Temperature rose to 101° The chest was clear on clinical examination

Her urine was normally normal except for a few W B C epithelial cells and mucus filaments

Peripheral W B C 6 000 per c mm (polymorphs 46 per cent lymphocytes 45 per cent monocytes 6 per cent eosinophiles 3 per cent) Hb 15 53 grammes per cent = 105 per cent

A large number of cases of epidemic influenza were being admitted to the hospital at that period she was considered to be one of such

On the 27th, after a comparatively restful two days she became rather restless complaining of low backached and painful pain which may have been premenstrual as she started her period the next day in the normal course of events There was further vomiting associated with some diarrhœa after preceding constipation A few scattered rhonchi were audible in the chest.

During the ensuing days there was general improvement she became apyrexial and appeared to have recovered from her acute upper respiratory infection although she showed marked apathy to her surroundings Detailed C N S examination was carried out but there were no objective abnormal signs and it was considered that she had only a post influenzal mild depressive state

On the last day of the year ten days from the onset of her illness and a week after admission to hospital she suddenly had three major epileptiform attacks followed by further vomiting Within forty eight hours she was obviously very ill toxic and cyanosed with fresh excoriated sordes vomiting and hiccough there was a great deal of post nasal purulent discharge and generalized bronchopneumonia with a transient pleural friction rub at both bases Temperature was rising and peripheral W B C 11 600 per c mm There was mental confusion and a general flaccidity with depressed reflexes Lumbar puncture was performed and gin-clear fluid under slightly increased pressure obtained

C S F analysis Protein 20 mg per cent chlorides 510 mg per cent sugar 71 mg per cent Cells nil Lange 0–10 Sterile on culture Chest x ray reported as clear Blood urea 38 3 mg per cent

On the 1st January she became semicomatose The chest was clearing clinically She had absent knee ankle and abdominal reflexes There was some neck rigidity and she would not or could not swallow Lumbar puncture was again performed the C S F was clear and under normal pressure (Protein 15 mg per cent chlorides 520 mg per cent Nonnes)

Later in the day she became more rational there had been no further fits but she complained of general headache Her reflexes were again obtainable but the tone was still very flaccid Blood pressure 110 60 Urinalysis—a few R B C and granular casts Sterile on culture Blood sugar 48 mg per cent Serum potassium 16-65 mg per cent Serum sodium 498 76 per cent Serum urea 30 6 gm per cent

4th January Pulse and temperature rising Her general condition was deteriorating with an ineffectual rattling cough Portable X ray picture showed the sinuses clear except for the left maxillary antrum The factor was contaminated with a strong smell of acetone The chest sounds were of bubbling respiration and the nose full of mucopus culture of which revealed a *Staphylococcus albus* There had so far been no response to intragastric and intravenous electrolyte therapy She again became semicomatose and cyanosed flaccid with absent knee and ankle jerks Lumbar puncture still showed clear fluid under normal pressure Serum sodium 214 mg per cent Serum potassium 19 3 mg per cent A little later in the day her general state showed some improvement

5th January Again fluctuating Able to speak and swallow but incontinent of urine and faeces Blood pressure 115/70 Serum sodium 244 75 mg per cent Serum potassium 27 3 mg per cent Serum calcium 11 0 mg per cent Peripheral W B C 35 000 per c mm (polymorphs 92 per cent lymphocytes 7 per cent monocytes 1 per cent) Lumbar puncture R B C 1 260 per c mm W B C 20 per c mm Protein 25 mg per cent Sugar 84 mg per cent Sterile on culture During the latter half of the

[illegible] improvement [illegible] appeared [illegible] and [illegible] well [illegible] rational [illegible] breath

6th January Appeared improved although very apathetic and [illegible] able to [illegible] general management W B C 31 600 per c mm (polys [illegible] 91 per cent [illegible] 8 per cent monocytes 1 per cent) Serum sodium 138 [illegible] per cent Serum potassium [illegible] mg per cent Urinary chlorides 5 6 grammes litre No sugar

7th January Two weeks after admission she again deteriorated and suddenly developed a rapidly ascending complete flaccide paralysis of all limbs abdominal and back muscles intercostals and diaphragm The neck muscles failed and she became very dyspnoic dysphagic and dysarthric comatose and cyanosed The P and R rate rose farther with subnormal temperature This was a complete paralysis with bulbar palsy with incontinence of urine and faeces She was placed in a Both respirator with additional oxygen via a B L B mask

After a further two days of great and distressing illness with only transient periods of consciousness and a gross state of bilateral pneumonia she died

Summary

A young girl apparently with influenza made almost complete recovery and then after three epileptiform attacks had pain vomiting, rising fever bronchopneumonia an encephalitic state associated with gross post-nasal infection and a generally flaccid state there was paradoxical blood and C S F cytology and biochemistry and a sudden onset of acute ascending flaccid paralysis resulting in bulbar palsy gross pneumonia and death

There had been no response to therapy which included electrolyte replacement and antibiotics in great profusion and the course of the illness was marked by the helplessness of the physician to halt in any way the march of events

Comments

Although the repeatedly low C S F chlorides are said to be diagnostic of T B meningitis the absence of any abnormal C S F cytology and the waxing and waning of her condition appeared against the diagnosis

The paradox of acetone in the breath no glycosuria hypoglycæmia low then high serum potassium low serum and polyuria was explained as a toxic effect on the pituitary from the encephalitis

After she had been placed in a respirator detailed assessment of her condition in consultation with the E N T surgeon and anæsthetist took place with a view to intermittent positive pressure respiration with a pulmoflator machine using oxygen enriched air via a tracheotomy tube. It was decided that the patient could not stand the tracheotomy and other steps entailed

Post Mortem

This was carried out on the 10th January and the salient findings were as follows

Pleural Cavities Lungs Air Passages —There were about 3 oz of slightly turbid fluid in each pleural cavity and massive pneumonic consolidation of the left lower lobe and the right lower and middle lobes The bronchioles bronchi and the lower portion of the trachea were choked with frothy muco

purulent fluid A small quantity of this fluid also extended up as far as the vocal chords

Skull Meninges, Brain Cord and Nerves —The pituitary infundibulum appeared haemorrhagic and œdematous The pituitary gland was recovered by taking away the whole of the sella turcica and the floor of the hypophyseal fossa As soon as the opening was made into the sphenoidal sinuses a large quantity of thick yellow glutinous fluid under some pressure poured into the base of the skull On opening the sella turcica the pituitary body appeared to be œdematous very considerably enlarged and pressing firmly against its confining bony walls No other macroscopic abnormality was discovered in the brain or brain stem

Histopathological Report —Floor of sella turcica and part of the sphenoidal sinus—the mucous membrane lining the sphenoidal sinus is œdematous, haemorrhagic and shows considerable round cell and polymorphonuclear cell infiltration

Pituitary Gland —There is present a large colloid cyst of the pars intermedia No other abnormality

Examination of a portion of kidney for urinary porphyrins was negative

Culture of pus from the sphenoidal sinuses is reported as "A large amount of mucus and some pus cells Scanty number of mixed organisms, Gram-positive cocci and diplococci No A A B B seen Later a growth of *Streptococcus viridans* isolated"

Diagnosis

Both during life and at post mortem this case presented a number of interesting possibilities which included

(1) Acute sphenoidal sinusitis with spreading encephalitis and pituitary involvement

(2) Influenzal meningomyelitis

(3) Poliomyelitis

(4) Acute toxic polyneuritis (Guillain Barré syndrome)

This latter is favoured by the absence of any C S F cytological and histological changes It will be recalled that the Guillain Barre Syndrome consists of a flaccid paralysis which may often be of the ascending type similar to Landry's paralysis, with or without sensory symptoms and a C S F typically showing gross excess of protein but little or no cellular change. It is reported, however that the march of the disease may be so swift that death ensues before histological changes take place Some of these cases are accompanied by porphyrin in the urine— Acute idiopathic porphyria —

Although much detailed examination of the patient treatment and many laboratory examinations were carried out only those that are of positive value have been recorded in the case description

The biochemistry was of great interest for its interpretation No treatment was of the slightest real value

The following report was received from the Consultant in Morbid Anatomy at the Bernhard Baron Institute of Pathology London E.1

N

Material [illegible]

Report — [illegible] large [illegible] between the [illegible] but this is [illegible] normal and the cells are present in [illegible] There is no evidence here of any cause of her death

This is [illegible] porphyria. These patients have all had pain as a most prominent symptom with mental disturbances of a somewhat hysterical type and although the urine may become dark only on standing there is usually enough colour to attract attention during the nine days illness at some stage. A leucocytosis would support my evidence but I do not think any morbid anatomical findings would help in this case. Had the patient been given barbiturates in quantity at the start or other drugs? Most fatal cases of acute porphyria have. Since there is nothing to support the naked eye post mortem description of abnormalities in the pituitary (sella) region I should fall back clinically on a Guillain Barré polyneuritis in spite of unchanged C.S.F. protein as the most likely diagnosis.

I wish to acknowledge the assistance given by the Department of Pathology R.N. Hospital, Plymouth and the Bernhard Baron Institute of Pathology. I also wish to acknowledge thanks to Surgeon Rear Admiral T. N. D'Arcy for permission to publish this case.

Reviews

THE HUMAN MACHINE. BIOLOGY SURVEY FOR THE ARMED FORCES. By Charles W. Shilling, Captain Medical Corps United States Navy. 1955. Pp. xiii + 292. U.S.A. United States Naval Institute, Annapolis, Maryland. Price $5.00.

This attractively produced book, with numerous illustrations, was edited and for the most part written by Captain Shilling. The author has had a widespread experience in the U.S. Navy including services with submarines, the Experimental Diving Unit, Office of Naval Research, Research Division of the Bureau of Medicine and Surgery. It is intended for the instruction of midshipmen of the Naval Academy in same, to officers in general.

[illegible] the information has evidently been to teach the reader sufficient anatomy and physiology to be able to understand how medicine in its broadest sense enters into the [illegible] activities of service life. The first one is devoted to pure anatomy and physiology, and the rest are devoted to its application to the material of the [illegible] chapters deal with nutrition, personal hygiene in general but is wide in scope, including [illegible] personal hygiene, dental hygiene, first aid, post control and under the heading "Miscellaneous" a brief mention of venereal diseases and other pathologies. The Preface is entitled "The Human Machine is part of the War Machine" and deals specifically with the relation of human to the Naval situation. It is this latter [illegible] the Service Medical Officer as it deals with operational medicine and the third section of publication which are generally outside the field of his clinical training. The [illegible] discussed the physiological problems encountered in sub-

[illegible] carmers [illegible] glass [illegible] [illegible] [illegible]

the [illegible] If fish [illegible] will provide you with both food and wa[illegible] How the [illegible] will probably be able to catch enough fish [illegible] to live on either hence thirst is open to criticism The instructions [illegible] The R N handbook recommends that fish flesh be avoided unless [illegible] fresh water are available to every survivor on that day when fish is e[illegible] [illegible] tration the excretion of urea, consequent on eating fish flesh necessitates a [illegible] h water

It is interesting to note that the [illegible] whatever you do do not drink sea water is given prominence in titles With this sentiment British opinion is in complete agreement

There is an obvious need for a single volume of this nature and the author is to be congratulated on his successful presentation and selection of material It is to be hoped that eventually a follow up publication will be produced in which the particular problems peculiar to each branch of the fighting services will be treated in more detail No such book at present fills the gap between this introductory volume and the specialized and highly technical detailed reports on current personnel problems It is probable that such a follow up would require separate volumes for the Navy Army and Air Force

Mention must be made of the ease with which The Hermit Machine can be read Its style at times tends to be conversational and occasionally philosophically ruminative This adds to the pleasure of its reading and being kept in bounds does not detract from what otherwise might have been a mass of difficult and dry data

SPOT DIAGNOSIS (Volume II) Compiled by the Editors of Medicine Illustrated. 1955 Pp 127 Illustrations 100 London Harvey & Blythe Ltd Price 8s 6d

Part I of this book consists of some 100 cases presented pictorially either in the form of direct photographs electro-cardiographs reproductions of X ray plates or microscopical sections The photographs appear on one page and on the reverse side there is the diagnosis of the condition together with an account of its etiology and treatment

Part II is devoted to notes on therapy which is divided into two sections One being devoted to dermatology and the other to certain medical conditions in which modern therapeutic advances are reported Some of the cases demonstrated in Part I which require more details of treatment are included in this part of the book.

The photographs in Part I have been selected with great care and due attention to detail and have been reproduced very well Colour photographs of many of the cases would have been ideal but in that case the cost of the production would have been very great

The notes on Therapy in Part II are very well set out and give good accounts of the modern treatment of the conditions described

The volume is certainly one which should be available to every medical student as an entertaining form of preparation for the clinical and field examinations as most of the cases are possibilities in such an examination It would also be an asset in any general practitioner's library as an aid to quick diagnosis

A HANDBOOK OF FIRST AID AND BANDAGING By Arthur D Belches M B B S (Lond) D P H (Eng) Desmond K Melvany M S (Lond) F R C S (Eng) F R C P (Irel) and Katherine F Armstrong S R N S C M D N (Lond) Foreword by Sir Cecil P G Wakeley Bt *K B E C B* LL D M Ch D Sc F R C S F R S E 4th Edition 1955 Pp xii + 464 Illustrations 200 London Baillière Tindall and Cox Ltd Price 8s 6d

This is one of the most comprehensive and readable books on first aid which we have come across. The authors have succeeded in holding a nice balance between elaboration and clarity By that we mean that their readers are given much more than the bare bones of the subject yet are not left dazed with details

Among [illegible] in cases of inter[illegible] 256) [illegible] mentioned for [illegible] in the teaching, [illegible] particular the pri[illegible]

The chapter [illegible] clear. One would [illegible] an alternative to the [illegible]

The illustrations [illegible] Many of them are new [illegible] the Helgar Nielson method [illegible] the Schaffer and Sylvester meth[illegible] the latter.

CARDIAC SYMPTOMS IN [illegible] By Doris M. Baker, M.D. [illegible] (Lond.) Physician to the [illegible] Anderson Hospital and the South London Hospital for Women [illegible] 1955. Pp. [illegible] + 50. London: H. K. Lewis & Co. Ltd. Price [illegible]

This is a well printed [illegible] book, now in its second edition, which gives a clear and concise [illegible] cardiac symptoms so often met in practice and for which no organic [illegible] demonstrated.

The book is easily read [illegible] the subject is essentially practical, and the points made in the text [illegible] in the carefully chosen case histories and illustrations.

We acknowledge with thanks receipt of the following publications:

Anales de la Facultad de Medicina Montevideo, *Annales Medicinae Internae Fennicae*, *Annals of Tropical Medicine and Parasitology*, *Australian Journal of Experimental Biology and Medical Science*, *British Medical Journal*, *Broadway*, *Bulletin International des Services Sanitaires*, *Gunma Journal of Medical Sciences*, *Guy's Hospital Gazette*, *Japanese Safety Forces Medical Journal*, *Journal of the Irish Medical Association*, *Journal of the Royal Army Medical Corps*, *Journal of the Royal Naval Scientific Service*, *Medical Journal of Australia*, *Medical Journal of Osaka University*, *Medical Press*, *Middlesex Hospital Journal*, *Military Medicine*, *Proceedings of the Staff Meetings of the Mayo Clinic*, *St Mary's Hospital Gazette*, *St Thomas's Hospital Gazette*, *Tohoku Journal of Experimental Medicine*, *Tropical Diseases Bulletin*, *United States Armed Forces Medical Journal*, *United States Medical Technicians Bulletin*, *Université de Montreal Revue Medicale*, *University of Durham Medical Gazette*, *Yokohama Medical Bulletin*, *Yonago Acta Medica*.

News of the Service

OBITUARY

[illegible] D. BROWNFIELD, C.B., O.B.E. [illegible] 1891 he qualified M.R.C.S. [illegible] R.N. Medical Service as a [illegible] year. In 1919 he graduated M.B. [illegible] He was promoted to Surgeon [illegible] in 1926, Surgeon Captain in 1941 [illegible] Retired List in 1950.

[illegible] World [illegible] Surgeon Rear Admiral Brownfield [illegible] and was present at the battle [illegible] He [illegible] 1919 [illegible] during at these appointments.

[illegible] War [illegible] Admiral Brownfield served [illegible] R.N. [illegible] H.M. Hospital Ship [illegible] R.N. Auxiliary Hospital [illegible] He was then appointed Medical [illegible] R.N. [illegible] where he served until December 1945 [illegible] H.M.S. [illegible] until 2nd January 1947 when he was promoted Surgeon Rear Admiral [illegible] Medical Officer in Charge R.N. Hospital Malta [illegible] in the Birthday Honours of 1948 and held the appointment of King's [illegible] 8th September 1947 to 14th July 1950 [illegible] Retired List.

[illegible] 1923 [illegible]

[illegible] B.M.A. [illegible]

[illegible]

[illegible] deepest sympathy [illegible]

Surgeon Captain [illegible] STARR [illegible] R.N. (Ret.) [illegible] March 1955 [illegible] 1881 [illegible] R.N. Medical [illegible] Surgeon Lieutenant [illegible] 1913. He [illegible] Surgeon Lieutenant [illegible] 1917, Surgeon Commander in 1925 [illegible] Retired List [illegible] Captain in November 1935. [illegible] employed during [illegible] War [illegible] until September 1946 when he reverted to the Retired List.

[illegible] Surgeon Rear-Admiral [illegible] R.N. [illegible] D.S.O. [illegible] W. [illegible] R.N. [illegible] H.M. [illegible]

Surgeon Rear-Admiral [illegible] BINNS (N.) R.N. [illegible] M. 18th May 1855. [illegible] 1881 [illegible] R.N. Medical Service [illegible] Commander [illegible] R.N. [illegible] H.M. [illegible]

During World War I [illegible] H.M. Ships *Ark Royal*, [illegible] He was [illegible] H.M. Dockyard [illegible] May [illegible]

Surgeon Captain W. F. CRIBB, [illegible] the 13th April 1855. Born in the [illegible] 18th [illegible] R.N. Medical Service as a Surgeon [illegible] Surgeon in 1908. Surgeon Commander [illegible] in 1926 with the rank of Surgeon [illegible]

During World War I [illegible] H.M.S. *Dublin*, Hospital Yacht *Isabel* [illegible] Medical Depot [illegible]

Surgeon Captain H. B. [illegible] R.N. (R.E.) [illegible] 18th April 1855. Born on the 3rd [illegible] 1879, he qualified in 1904 [illegible] R.N. Medical Service as a Surgeon in November 1904. He was pr[illegible] Lieutenant-Commander in 191[illegible] Surgeon Commander in 1917 and [illegible] Retired List (age) with the rank of Surgeon Captain in August 1929.

During World War I Surgeon Captain [illegible] H.M.S. *Highflier*, *Galatea* and *Port Royal*.

Surgeon Commander H. A. CLARKE, R.N. (R.E.) [illegible] on the 27th April 1855. Born in the 18th December 1895, he qualified [illegible] 28 and entered the R.N. Medical Service [illegible] Surgeon Lieutenant-Commander [illegible] He was promoted [illegible] Surgeon Lieutenant-Commander [illegible] 1945. Surgeon Commander in 1941 and was placed on the Retired List (age) [illegible] 1950. But [illegible] and continued to serve until October 1953, when he retired [illegible] Retired List.

During World War II Surgeon Commander [illegible] in the R.N. Hospital Chatham, H.M.S. *Nimrod*, H.M. Dockyard Bermuda and R.N. Auxiliary Hospital Fort Pitt.

HONOURS AND AWARDS

Companion of the Order of the Bath

Surgeon Rear-Admiral S. C. Ransford, M.D., Sc.D., B.Ch., M.R.C.P. (Lond.), D.P.H., G.H.I.

PROMOTIONS

To Acting Inspector Surgeon Commander—R. S. McDonald.
To Surgeon Lieutenant-Commander—W. B. Willett.

TRANSFERS TO PERMANENT LIST

Surgeon Lieutenant—M. J. Boyle, R. M. Butler, A. T. Davidson, C. W. J. Usher.
Surgeon Lieutenant (D)—K. R. Needham.

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O O McCarthy M B B Ch H J McLoughlin M B B Ch B A O B A A Phillips, M B Ch B J W Richardson M B B S R M Whitaker M B B S P R. T Wood M B B S B H Manning L D S R L West B D S

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900.—Medical—Revised Arrangements for Medical Treatment whilst on Leave or on Detached Duty.

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1538.—Medical, Hospital and Dental Treatment Abroad.

1539.—Medical—Pulhems Assessment—Annual Review.

1542.—Surgeons and Agents.

Notice

The Editor invites medical officers to send in original papers on professional subjects, travel personal experiences &c Items of news and matters of interest to the naval medical service will be welcomed from ships and establishments on home and foreign stations Notices of births marriages and deaths are inserted free of charge to subscribers

All articles or communications published in the JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE will become the property of the Journal with full copyright powers unless the author declares when sending in the article that he desires to reserve the copyright to himself

The Harvard system should be employed for bibliographical references these references being arranged in alphabetical order of the authors names at the end of the contribution, thus Smith F G (1935) *J roy nav med Serv* 22, 53 In the text a reference to a publication should be cited by giving the author and in brackets the date thus 'Smith (1935) believed this to be due &c

The Journal is published quarterly four numbers comprising one volume.

Articles and communications may be sent to the Editor at any time They should be clearly written or, preferably, typed and sent in duplicate to The Editor R N Medical School Alverstoke Hants

Subscriptions

For R N and R N V R medical personnel on the active or retired list and for Consultants to the Royal Navy the subscription is 20s per annum (postage included) payable on 1st January of each year Single copies 5s

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JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE

R N Medical School Alverstoke Hants

Surgeon Vice-Admiral Sir Reginald St. G. S. Bond, K.C.B., M.B., F.R.C.P., F.R.C.S., Ed.
Medical Director-General of the Navy 1931–1934
Died 27th July, 1935

Volume XLI Autumn 1955 No 4

Journal of the Royal Naval Medical Service

Articles

JUBILEE OF THE ROYAL NAVAL HOSPITAL, CHATHAM

To mark the fiftieth anniversary of the opening of the Royal Naval Hospital Chatham by His Majesty King Edward VII on the 26th July 1905 the hospital grounds were thrown open to the public on the afternoon of 26th July when the Annual Hospital Sports were held A number of photographs of the opening ceremony and of the hospital and staff in 1907 were displayed together with samples of the work done by patients at the present day under the auspices of the Occupational Therapy department

On 22nd July a garden party was given by the officers of the hospital and on Sunday 24th July a special jubilee service was held in the hospital church Part of the Royal Engineers band contributed to the music and the service was attended by the Commander in Chief The Nore and the Admiral Superintendant

It may be of interest to recall the salient points in the history of this Royal Naval Hospital No record exists of any Service hospital in the Chatham area prior to 1827 when the foundations of the Melville Hospital were laid Built at the suggestion of the Lord High Admiral the Duke of Clarence (afterwards William IV) it was completed the following year and was designated the Royal Naval Hospital Chatham

With the expansion of the Fleet at the turn of the century and the increase in size of the Chatham Port Division a larger hospital became necessary Windmill Hill about 220 feet above sea level was chosen as its site and thus the present hospital had its origin

It was designed by Mr J T C Murray and erected under the direction of Sir Henry Pilkington Civil Engineer in Chief Built on the Pavilion system the main corridor is nearly a thousand feet long while the grounds cover an area of thirty nine acres

On 26th July 1905 the new hospital was formally opened by His Majesty King Edward VII and replaced the Melville Hospital Melville was turned over to the Royal Marines who still occupy it

In 1907 nine medical officers one head wardmaster seven sisters and about seventy sick berth ratings comprised the medical staff Since then various special departments have been introduced to keep the hospital abreast of the times The present medical staff consists of seventeen medical officers

one dental officer six wardmaster officers thirty sisters and over three hundred sick berth staff including members of the Women's Royal Naval Nursing Service and Voluntary Aid Detachment The complement also includes a chaplain a welfare officer and officers and ratings of the Supply and Educational departments besides a large number of civilians

H.M. [illegible] [illegible] July [illegible]

Recollections [illegible] may also be of interest My first acquaintance with Chatham was at the age of 44 when on the 12th April 1905 I arrived at the Inspector General's house at the new Royal Naval Hospital The house was not then completed several rooms being out of action and an unauthorized trip up the back stairs to the attics nearly resulted in disaster because there were no floor boards there

The grounds bore a very different aspect from their present appearance There were no trees and no church and the open space between the hospital and residences was just rough grass with numerous birds nests in it Later in the year a crop of hay was gathered from part of this ground There was no surrounding wall though the main gate and police station had been completed and some policemen were on duty there Iron railings bounded the hospital area these in places were of the hurdle type providing easy access to the Lines for small children, though something of an obstacle to long-

skirted naunies I have since learnt that several patients had to escape and much illicit beer had to come in before approval to build a wall could be obtained

"The first event of note was the laying of the foundation stone of the church by the Commander in Chief Admiral Sir Hugo Pearson on the 1st May 1905 Some marquees had been erected for the occasion but a howling gale during the night blew them all down. After much panic they were re erected in time for the ceremony at 11 a m but the gale continued and my chief recollection is of much clutching of hats and skirts The building of the church then progressed rapidly Meanwhile the present petty officer patients day room was used as a church and kept permanently rigged as such

"Shortly after this our carriage and pair arrived The stables had not then been built so the carriage was stowed in the fire engine house at the main gate and the horses were kept at Kent s stables near the Westcourt Arms Where the fire engine was kept I do not know but it did not return to its proper place until the stables were ready some months later

"A new motor ambulance (it must have been one of the earliest) appeared one day and I remember driving round the hospital in this with my father Its look cannot have been very good or the driver was not very skilful as we had a number of collisions with the banks at corners it rammed one bank so firmly that a horse had to be produced to tow it out! As a result the layout of the roads particularly in the receiving room area had to be modified

"As the date of the King s visit approached the hospital began to take on rather a different appearance Contractors huts and the accompanying mess disappeared the grass in the vicinity of the main entrance was mown and a few small trees were planted Some of the patients began to arrive from Melville with doctors sisters and sick berth staff and more and more places became out of bounds to children A covered platform was built outside the main entrance and on the opposite side of the road a stand for spectators was erected and decorated with bunting which was also used freely to disguise the remaining contractors huts and other mess

"On the 25th July the house filled up with visitors relatives and the Medical Director General Inspector General Ellis and Mrs Ellis Wednesday the 26th July was fine and very hot and the forenoon passed very slowly but in due course after lunch and all dressed up I walked over to the stand with my mother and the house party solemnly shook hands with various important persons took up station in the front row of the stand and surveyed a brilliant scene of bunting and gorgeous uniforms The guard and band from the Royal Naval Barracks marched in and took up station just in front of the stand and then followed what seemed an interminable wait in the sweltering heat In due course cheering from the crowd outside relieved the suspense The Royal Standard was broken at the masthead and the King, in the uniform of a Field Marshal drove up to the main entrance in a state landau with four horses and outriders and very closely attended by a rather disreputable looking dog This dog and the antics of a policeman trying to catch it have left a vivid impression on my mind After the Royal Salute

a few presentations on the platform and a short religious service. The King accepted the golden key presented to him on a cushion by my father and unlocked the main door. The party then disappeared inside and there followed another long and very hot wait. In due course the party reappeared the King entered the carriage and after another Royal Salute drove off.

I learnt afterwards that the inspection of the hospital finished in my father's office where, contrary to orders, champagne was laid on—some liquid refreshment must have been badly needed. It had been intended that the King should plant a tree to commemorate his visit but after the champagne this formality was forgotten so the tree was planted the next day by my mother assisted by me—at about

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THE PROBLEM OF NITROGEN NARCOSIS

BY

Surgeon Commander W. A. BURNETT, R.N.

In 1861 J. B. Green in America reported on the feeling of sleepiness which he noticed in his deep dives (about 180 feet). It was then considered important as he stated that with that symptom the diver must be immediately brought up. Visual symptoms were also noted and Green's full report shows evidence of a belief that a diver's judgment was impaired during his exposure to compressed air.

Caisson workers are exposed to a pressure of one to five atmospheres equivalent to a depth of 150 feet. Hill and Macleod (1903) recorded the report of a caisson worker as follows: "You felt a wee bit giddy when you went in. I never felt happier than when I was in compressed air. Always happy and on the cheery side." Hill and Greenwood (1906) experienced sensory changes of an anaesthetic nature when in compressed air. Damant (1930) reported that divers became abnormal mentally and suffered a loss of memory in deep dives up to 300 feet. Phillips (1932) reported that "there is manifest a dangerous over confidence accompanied by dulling of mental ability, difficulty in assimilating facts and of making quick decisions." Many reports, investigations and theories have been put forward for this condition during the past twenty years by physiologists interested in diving, notably J. B. S. Haldane in this country and Captain A. R. Behnke (*M.C.*) United States Navy in America.

A modern description of this condition can be read in Cousteau's book "The Silent World" in which he describes his feelings under pressure as follows: "I am anxious about that shot line, but I feel really wonderful. I have a queer

feeling of beatitude I am drunk and carefree My ears buzz and my mouth tastes bitter This is what Constean calls L Ivresse des grandes profondeurs — Rapture of the great depths

Let us now consider the condition from the clinical angle It arises in persons who are subjected to breathing air at pressures above that of 100 feet of water (over 4 5 lb to the square inch above atmospheric pressure or at 4 atmospheres absolute) and at that depth after half an hour

The symptoms noted are feelings of stimulation assurance and well being The subject shows a tendency towards laughter and loquacity and exaggerated confidence in ability to accomplish a given task The signs show that responses to visual auditory olfactory and tactile stimuli are delayed and that mistakes are made in simple arithmetic There is loss in fine neuromuscular control and co ordination At 200 feet and above the signs and symptoms are more marked there is also lapse of memory and in some persons dizziness Between 350 and 400 feet there is loss of consciousness

The picture exhibited is strikingly similar to that seen in alcoholic intoxication and interestingly enough is approximately as variable Individual variations in susceptibility exist and this has been attributed by some authorities in part to differences in emotional stability We have all seen the various ways that different individuals react to alcoholic intoxication and similarly different individuals are affected by the condition under discussion No great trust should be placed in human intelligence under these circumstances

Several causes for this condition have been put forward and considerable research has been done

The causes and reasons put forward have been

(1) Purely an effect of increased pressure alone

Moxon (1881) suggested that it was due to the increased pressure to which the body was subjected driving the blood away from the surface of the body and into any parts that are not accessible to air such parts being the interior of the cranium and spinal cord.

This theory was proved incorrect because if this was the case there would be blanching of the skin and superficial tissues which is not so The physical properties of the body are such that the pressure is equalized immediately Breathing various mixtures of gases at the same total pressure varies the narcotic effect

(2) A stimulating effect due to the increased tension of oxygen This is not acceptable because breathing pure oxygen at one or more atmospheres does not produce a similar condition.

(3) A purely psychological effect Psychological tests carried out on persons who failed in completing tasks under pressure due to such symptoms as described were demonstrated to be suffering from claustrophobia

(4) Narcotic effect of the increased tension of nitrogen

Before we consider the pros and cons of this theory we must turn to our knowledge of the action of anesthetics upon the body The mechanism by which anesthetics depress the activity of the central nervous system is poorly understood, but one theory of the many put forward has a bearing on our subject

The Meyer Overton Law states that there is a direct parallelism between the affinity of an anesthetic for lipoid and its depressant action in other words the more soluble an agent is in oil and the less soluble in water the more anesthetic it will prove to be Thus we have an oil water solubility ratio Inasmuch as nerve cells and membranes contain lipoids the anesthetic is thought to gain access to nerve tissue by virtue of its lipoid solubility Evidence rests on the fact that arrangement of a series of chemical agents according to their solubility co efficient agrees fairly well with the order obtained by grouping the same substances according to their anesthetic potency

The body solvents for the inert gases of the air such as argon nitrogen helium and krypton are the fluids and fat of the body Olive oil has a co efficient of absorption similar to body fat and can therefore be used for solubility determinations

Solubility in Water			*Solubility in Oil*		
Argon	*Helium*	*Nitrogen*	*Argon*	*Helium*	*Nitrogen*
0 0261	0 0087	0 0127	0 1395	0 0148	0 0667

Oil Water Solubility Ratios		
Argon	*Nitrogen*	*Helium*
5 32 1	5 24 1	1 7 1

It was therefore in 1935 that Captain A R Behnke (*MC*) U S N attributed the remarkable narcotic or intoxicating effect of air at high pressure to the nitrogen present The way in which nitrogen acts was considered to be due to its high solubility co efficient in fat compared with water and thus that it acts in the same way as the aliphatic anesthetics the action of which according to the Meyer Overton Law appears to be related to their oil water solubility ratio

To substantiate this theory if nitrogen is replaced by helium which has a lower oil water ratio for the air supply to a diver we find that this oxygen helium mixture abolishes the narcotic effect In fact an experienced diver at 300 feet felt well and was conscious of being only a depth of 100 feet In contrast the sudden introduction of air at a depth 300 feet to a diver breathing helium produced a sensation of floating away dizziness and loss of muscular control accompanied by an insistent demand to be brought to the surface In effect the diver was experiencing the first stage of inhalation anesthesia Conversely if argon which has a higher oil water solubility ratio be substituted then the narcotic effects are greater and come on at lesser depths than with air

A further point in favour of this theory is that narcotic effects occur when breathing varying mixtures of oxygen and nitrogen when the partial pressure of the nitrogen reaches the same level

Against the nitrogen-narcosis theory is the fact that the greatest mental change is noticeable immediately upon reaching the pressure and lessens as the subject becomes adjusted If it were due to a purely narcotic effect the symptoms would increase with exposure rather than decrease Divers are also said to become acclimatized to nitrogen

A further contradiction to this oil water solubility [illegible] theory is seen in the case of hydrogen which has an oil water ratio of 3 1 One would therefore expect that breathing an oxygen hydrogen mixture a narcotic effect greater than that of breathing an oxygen helium mixture would be produced but this is not the case there is little or no narcotic effect when breathing an oxygen hydrogen mixture This was demonstrated by Arne Zetterstrom in 1945 who dived to a depth of 533 feet on a mixture of 4 per cent oxygen and hydrogen

It has also been suggested that another physical property might influence the activity of helium, nitrogen and argon namely their molecular weight Helium with a molecular weight of 4 induces the least disturbance while the molecular weights of 28 and 40 for nitrogen and argon respectively indicate their relative difference in narcotic effect The molecular weight of hydrogen is 1 which gas has also little or no narcotic effect as mentioned previously

(5) Finally a fifth cause has been put forward by a number of experienced physiologists who have thought that the increased carbon dioxide tension in the alveoli due to the increased density of the air in the lungs and the fact that under conditions of rising pressure more air enters than leaves the lungs has caused these effects and that there might be an increase in carbon dioxide concentration in the alveoli An extensive study was reported by John W Bean of the Department of Physiology of the University of Michigan (1950) who carried out experiments on dogs Rapid compression of anaesthetized dogs to 4½ and 9 atmospheres caused a pronounced increase in the alveolar carbon dioxide and the experimental data put forward by Bean was considered to provide substantial evidence that the changes in alveolar carbon dioxide and the attendant alterations in the carbon dioxide of the blood and tissues constitute an exceedingly important contributing agent if not the sole cause of these subjective and neuromuscular reactions induced in individuals subjected to rapid compression

However during the latter part of 1954 experiments under the direction of the Superintendent of the Royal Naval Physiological Laboratory and devised by Surgeon Lieutenant C Rashbass R N V R were carried out on human subjects who were rapidly decompressed to 250 feet or just over 8 atmospheres and samples of alveolar air were taken on reaching that depth and again after ten minutes The results have not been published as yet but the experimental results show that there is apparently no increase of the carbon dioxide tension in the alveoli

Although we read about nitrogen narcosis in all the publications in connexion with diving the cause of the subjective changes induced in divers at depths of 100 feet has not been properly clarified and though we have means of combating the effect of compressed air on human subjects at great depth by the use of helium and even hydrogen the exact cause of the condition has as yet to be definitely established

At the moment nitrogen is still regarded as the most likely cause of the condition but there is still opportunity for more work by the physiologists interested in this great problem connected with diving

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A MEDICAL VIEW OF THE VOYAGE OF H M S. *CHALLENGER* 1950-1952

BY

Surgeon Lieutenant-Commander D O HAINES, R N

H M S *Challenger*, the oldest of the surveying vessels then in service from May 1950 to September 1952 carried out geophysical and oceanographical observations during a voyage which encircled the world The greater part of the trip was spent in the Pacific Ocean

A scientific and general narrative of the expedition has been published elsewhere (Ritchie and Gaskell 1953 Gaskell and Ashton 1954) and papers dealing with the various observations made have now appeared

Unlike the famous voyage of an earlier *Challenger* in the last century biological exploration was not a special commitment It was however clear that, in view of our itinerary and the fact that as in most fields of enquiry phenomena do not separate rigidly into the exclusive categories of Physics Chemistry Biology etc opportunities and necessities for biological recording and collecting would arise In the absence of a professional biologist this work or some of it fell to my charge

A collection of marine and shore specimens was made Some of this was done at the request of museum workers having special interests while other work was at our own whim The residue of the collection has now been lodged at the British Museum and is available to those interested in the biological types or the site of collection some of the material having already yielded fruit (Totton)

My purpose here is to give an account of our activities in this field partly because of the interest displayed by many naval medical officers and partly

because I believe that the Navy will take a continuing interest in this type of work I hope that this account may be useful to doctors given similar opportunities particularly in surveying vessels

Plankton

General—Samples of Plankton were taken throughout the trip The technique was very simple Conical nets the cod ' end of which ended in a small ' bucket ' were towed astern for a chosen period then hauled and the contents of the bucket decanted into a large glass jar The nets were of silk cotton or hessian depending on the mesh which varied from 100 to the inch to 1 mm squares

The depth and speed of tow could be varied at will but it was soon realized that the speed of the ship s drift when stopped was optimal An increase in speed reduced the catching power of the net by turbulence at its mouth and distension, also running the risk of spoiling precious equipment

At first daily night and morning hauls were made and the whole catch preserved in formalin sea water As experience was gained only occasional specimens were retained for the collection the remainder being ditched after examination to avoid overloading the collection

Plankton does not form a biological group but covers many phyla of both animal and plant kingdoms Strictly the term applies only to those organisms of the upper layers of the sea whose structure is adapted to reduce sinking, either by its shape or by the enclosure of fats in air to give buoyancy and having only limited powers of locomotion However the term is often used to cover all small organisms in the upper layers indeed many free swimming forms begin life as plankton undergoing a metamorphosis as they mature e g fish and crustacean larvæ

A typical catch of a plankton net in North Atlantic in spring might contain specimens of Tomopteris (a semi transparent chætopod) Sagitta ' (arrow worm) ' Calanus (a marine copepod resembling Daphnia familiar to first M B students) Euphausia (shrimp like crustacea some species of which form a great part of the whalebone whale s food) Medusæ (many different species some of which are familiar as the jellyfish of shores and harbours), ' Pteropods (free swimming molluscs, sea butterflies) fish eggs and on close examination diatoms and other marine plants

At night it could be seen that many of these animals were phosphorescent This property is exhibited by a high proportion of marine organisms its physiology and biological meaning form fascinating subjects for investigation and speculation

The rather haphazard collection of plankton thus made was not of as great scientific interest as it might have been in the day of our famous predecessor when nearly all observations were original and merited description The collection of plankton as part of the investigation of other ocean phenomena was however of significance

Echo Sounding Deep Scatterers

A special application of plankton collections was [illegible] of the scattering layer or false shoal phenomenon.

A preliminary explanation is necessary here. When [illegible] sounding, to transmit sound returns as an echo from the sea bed and [illegible] The recorded echo is empirical records its time of arrival [illegible] on a rolled sensitive paper and is interpreted as fathoms of depth. [illegible] water objects fish shoals etc. can also reflect these transmissions giving characteristic traces at a depth less than that of the bottom. This [illegible] application in salvage work and the hunting of fish shoals. The false shoal is a more mysterious phenomenon. This usually is only observed on sea of great depth. Something in the water reflects sound from a shallower depth than the bottom usually within the top hundred fathoms giving rise on the Echo Sounder to an unbroken trace resembling that received from the sea bottom. When the water is very deep and the bottom echo consequently faint or if the machine is not phased to the correct group of depths to record the true bottom echo it is easy to mistake this anomaly for a shoal bottom. Many of the shoals reported in the oceans since the use of continuous recording echo sounder equipment became general in all classes of ships seem on investigation to belong to this category.

Many explanations of this scattering have been suggested. The hydrologist favoured a hydrological explanation and the biologist a biological explanation. Water temperature and salinity measurements do not supply an answer and most workers now favour a biological explanation involving the migration of plankton.

We had two main chances of investigating these occurrences. The first should near the Newfoundland Banks was circumscribed and more so added that seen where a shoal of fish is present. Rich hauls of plankton including medusae and pteropods predominated were made concurrently with observations of sea temperature and the taking of water samples for chemical analysis. Towards the end of our investigations a fin whale surfaced close by, it had probably been grazing on the plankton present.

The second experience in the Pacific on passage from Panama to San Diego was typical of that described in the literature of False Shoals. For a period of five days there would appear shortly before sunset an echo about 20 fathoms thick at about 150 fathoms below the surface. The ocean depth was over 1,000 fathoms. The layer would ascend to 20–30 fathoms and remain all night descending just before daylight and fading away. The weather was good and so this many observations were possible. In addition to frequent sallings in below and above the layer the sea surface illumination and the transluscency of the water were measured while temperatures were recorded and water samples taken. These observations cannot be said to have solved the problem. There was no correlation between the appearance of the layers and the gradients of sea temperature or salinity. This is in accordance with other workers results. The measurements of illumination in and in the

[illegible] the [illegible] than the [illegible] of the living [illegible].

We found [illegible] greater in the layers [illegible]. On the [illegible] of Mr [illegible] Cohen [illegible] supported [illegible] scattered plus the [illegible]. The [illegible] objection to the acceptance of [illegible] organisms [illegible] surface as the whole explanation of [illegible] scattering [illegible] cannot allow that the organisms concerned could reflect [illegible] so strongly. It has been suggested that fish with the stronger [illegible] owing to their swim bladders may be grazing on the plankton [illegible] rise to the spurious echoes. This theory is difficult to establish [illegible] that animals cannot easily be caught with nets. [illegible] much in these layers using fish traps [illegible] with [illegible] and the [illegible] have been seen to move up and down as the light [illegible]. One ingenious investigation has related the sizes of the [illegible] to the frequency of the sound used by the echo sounder.

In contradiction of what was said earlier about the [illegible] of the descriptive approach yielding fruit in these times, one of the samples taken during this investigation was a new species of siphonophore [illegible] (Totton) and given the name Lensia Challengeri.

THE RED TIDE

A plankton phenomenon we had the good luck to see was the [illegible] "Red Tide" off the East Coast of Japan. Our first encounter [illegible] swathes of red and yellow streaking the sea surface. The [illegible] twenty yards wide and many miles in length. Dipping [illegible] collected from these bands masses of transparent globules [illegible] in diameter. Microscopically these were seen to be flagellates with [illegible] ruptured capsule. These were Pyrocystis Noctiluca [illegible]. This name was justified that night when we were treated to an incredible display of phosphorescence. The sea as far as the eye could reach blazed with the typical bluish white light. I do not remember anyone having the presence of mind to try, but presumably the proverbial newspaper could have been read.

The name "Red Tide" describes the occasional event when these swimming organisms are carried into harbours and inlets. The flagellates are toxic to many animals, particularly molluscs and fish. "Tides" have often destroyed mollusc beds. The Japanese cultured pearl industry had its success delayed many years when one of these "Tides" destroyed the experimental oyster beds in Kyushu.

OTHER OBSERVATIONS

DEEPEST OCEAN SOUNDING

During the ship's passage south from Japan to New Zealand in 1951 a preliminary survey was being carried out over an area of the Marianas Trench prior to carrying out a seismic experiment in the area. It was found that the depths being recorded were becoming very great indeed and after beyond the range of the E.S. and Asdic sounding gear. These readings were supplemented

by measuring the travel and return times of the sound from small explosions and finally a wire from the taut wire measuring gear was lowered into the deepest area. This produced an uncorrected reading of 5,954 fathoms. Even after applying the most unfavourable corrections this gives a true depth of 5,899 fathoms, greater than ever before recorded.

On the return north the area was again investigated and in addition to confirming the depths by the Lucas wire sounding machine a bottom sample was secured from 5,734 fathoms, again the deepest known and this sample is now lodged in the British Museum (Gaskell, Swallow and Ritchie, 1953). On examination the sample was found to contain easily recognizable diatom skeletons.

Bird Observations

Records of birds seen and their numbers at set times of day were recorded throughout the cruise in the Pacific. After some experience those on watch became adept at identifying the common birds of the ocean using Alexander's Birds of the Ocean, and thus cleared the ground for unusual observations. The record of these observations has been reported and discussed elsewhere (Macdonald and Lawford, 1954).

A well documented sighting of the short tailed albatross created great interest since the bird had not been seen for some time and was believed extinct due to spoliation on its breeding grounds by feather hunters. The observers were unaware of this fact which is not mentioned in Alexander but scrutiny of the records and photographs by zoologists has led them to accept this as a true sighting. This bird may have been an isolated survivor as they are a long lived species. If the species is re establishing itself further sightings may be expected in the future.

Shore Work

Our biggest efforts on shore were made on our visit to the Gilbert and Ellice Islands in the autumn of 1951.

Biological Collections

At Funafuti, a typical atoll which will be remembered by some who served in the Pacific during the war, a large collection of seaweeds and molluscs was made for the Auckland Museum. A whole day was spent collecting at each of five stations all round the atoll. In bright sunshine with always a stiff cooling breeze and usually up to the waist in water this task seemed to us to be one of the best ways of both enjoying oneself and contributing to culture, yet devised. We could eat lunch in the shade of the palms, refreshing ourselves with drafts of green coconut and then return to the delightful water which almost assumed the character of an obligate environment for us. The reefs at Funafuti, between the slightly raised cultivated islets, are of coral limestone and covered only when the tide is high. The soft rock is full of pools, channels and crevices in all of which there is abundant life. Burrowing mussels are everywhere but we found it impossible to prise any loose without severe trauma, however, there was no lack of other more easily won shellfish. There were many species

of "Conus" which we had been specially asked to collect. There are tales of illness and even fatalities from the bite of one type of this animal. We approached them all with caution and survived. In the brackish ponds where mangroves grow live the large cowries of which we obtained many specimens. These shells are very ornamental and are used in all colours and sizes in toys, jewellery and handicrafts. In earlier days long prior to bulk buying of copra for margarine manufacture similar shells were used as currency all over the Pacific. We found about a dozen different seaweeds, green and red. They were quite unlike the leathery wracks of the British coast, having a fragility of structure and colouring most attractive to the eye. One species which has stangs and bunches of tiny green globes like immature grapes is eaten by the children but did not appeal to my palate. The first sight of the hundreds of different species of coral growing in the fringing reefs inspired a desire to make a collection. This was abandoned when I realized how rapidly the appearance of these corals deteriorates after death and how much they weighed, not to mention the smell.

As well as in the shore collection the people of Funafuti co operated in trapping rats in an attempt to determine what ascendancy the managerial ships' cats had achieved over the earlier invader, the brown Polynesian cat. A number of rats were secured and pickled for shipment to New Zealand. Only one appeared to be a brown cat. A task entrusted to the Engineer Officer was the collection of a fresh sample of Palm toddy. This fluid was frozen to arrest fermentation and taken to Fiji for assay of vitamin content. This sweet slightly alcoholic drink is one of the islanders' principal sources of the B complex, and its withholding from children on social grounds is said to have led to the appearance of avitaminosis. Toddy is the sap from the palm collected in suspended cups from several feet stems. Even while accumulating during the day the natural fermentation commences, giving a taste, appearance and effect like home brewed ginger beer. It is in this state that it was consumed in Funafuti. Elsewhere it is distilled and forms the basis of such drinks as "Arrack."

I have so far deliberately not mentioned the geophysical work which was the main scientific effort of the ship. One team of physicists was engaged in a world wide survey of the deep ocean beds by the use of seismic methods. This employs a technique of measuring the travel of sound waves from an explosion to determine the thickness and the nature of the rocks underlying the ocean bed. The method is adapted from that used in prospecting (as far all) ashore.

The method involves the letting off of a series of explosions at different distances from fixed receivers, in one case for use of hydrophones suspended from sono buoys which transmitted the received sound to the recording gear in the ship.

As a change from carrying out these investigations in deep oceans the method was applied to discovering the structure of formation of atolls. The two principal theories differed briefly over whether coral was formed on the tops of submerged sea mounts in fairly shallow water (Murray's theory) or

whether fringing reefs formed on volcanic islands which slowly subsided while the coral continued to grow and keep up to the surface (Darwin's theory). The essential point is that of forming reefs which do not grow below 200 feet and taking Murray's explanation the coral should not exceed this thickness. Bore holes were sunk at Funafuti in 1904 to try to settle this point. The deeper one still indicated coral to over 1,000 feet. Other expeditions elsewhere since achieved similar results at varying depths. This evidence was not conclusive for the subsidence theory since all the really deep borings were at the seaward edge of the atolls where great thicknesses of coral might be explained by the spill of dead coral down the sides of an underlying mound.

The use of seismic methods might give a complete picture of the pinnacle arising from the deep ocean floor on which the atoll is the visible peak.

The work done at Funafuti, though not exhaustive, gave results consistent with shallow water reefs having grown over a volcanic peak which had sunk under its own weight, the coral thus reaching a great thickness (Gaskell and Swallow, 1955). Similar results were obtained at Nukufetau.

Nukufetau

Nukufetau was visited primarily to fix its position by star methods ashore. It was found to be about six miles from its charted position (Gaskell and Ratcliffe). While these observations were being made a programme of collecting as before was carried out, the collections this time going to the British Museum. Working conditions at Nukufetau were less pleasant than at Funafuti. A fringing reef inside the lagoon often necessitated wading up to the neck carrying precious gear.

Elsewhere on Shore

Throughout making our own observations we saw a great deal of biological interest. In Canada visits to Vancouver Island enabled us to witness the tail end of the Coho salmon run. The sight of these great fish struggling up a mountain stream in only an inch or so of water to their spawning grounds is unforgettable. Dead or dying salmon were everywhere, the birds and forest creatures reaping a great harvest. This migration was epitomized by one of the salmon conservators as "the greatest manifestation of the sex urge we were ever likely to see." The physiology of the transitions of this type of migratory fish from fresh to salt and back to fresh water gave rise to some speculation in my mind. The appearance of these fish, their yellowish skins discoloured by pathological brown pigmentation, their hebetude and perseveration put one in mind of the classical description of Addison's disease. Their adrenals had probably given up the struggle.

Around Canada we did a great deal of shooting and fishing, rarely with orthodoxy, but also rarely with result. Our diet was varied with deer meat (venison but no relation to the dark stringy putrescent dish offered by the English cousinry) duck, geese and turnstone. Salmon fresh and smoked was the normal passer's issue, but we also contributed salmon grilse for breakfast by our own efforts. All this was, however, eclipsed when a swan dinner was

achieved in the North Pacific The frequent stories of the delights of eating globe-fish in Japan could not overcome the reluctance induced by the memory of the rapid demise of one of our cats after a gorge on one of these fish in the south In sublethal quantities these fish induce a mild paralysis with apparently a delightful aura and are extensively consumed in rather specialized Japanese restaurants There are deaths from time to time when consumers take one bite too many round the bony The cult is too well established for effective public health action

So far nothing has been said of my medical aspects of this voyage Of the many hospitals visited the outstanding one was the Tripler General in Pearl Harbour This newly constructed in-service establishment had a luxury of appointment which would not have disgraced a six star hotel At the other end of the scale in a bungalow hospital in Bumabulu an excellent standard of medical attention was maintained by two assistant medical practitioners (trained for four years in Suva) It was temporarily disquieting when about to make the first incision there for a cold appendicectomy to learn that there was no electricity for the lamp as the diesel's injectors were being refitted in Fiji Daylight and hand torches filled the bill

The many medical schools and oceanographic laboratories visited are now kaleidoscopic in memory The outstanding impression being that whatever the luxury or lack of it in the buildings the pleas which the work was being done were the same in all countries and languages The same piles of printed matter on desks floors and shelves the same intricate devices their use never or forgotten (yet still not dismantled) the same delight in explaining examining and arguing were found everywhere

There is no great moral or doctrine emerging from the experiences summarized here except to remark that the world even if shrinking is still large enough to be interesting and that the appetite for seeing the remainder is undiminished

I am indebted to the published work of all concerned in this voyage and even more so to the sharing of their brains and views when we were so engaged together Detailed acknowledgment is thus very difficult

The references refer mainly to general papers covering our activities and are not exhaustive A full bibliography can be found in the papers listed

I would also like to acknowledge the interest shown and help given me by the Director and Staff of the Marine Biological Association

Such Berth Petty Officer W Smithy did most of the hard work of collection preservation and maintaining the catalogue and gear

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MACDONALD J D and LAWSON T A (1954) H M S *Challenger* Tropic birds *H Tropic*

TOTTON A K Siphonophora of the tuna in Oceanic (Discovery Reports)

SAMPLE PAGE FROM MARINE BIOLOGICAL RECORD

Date Time	*Position*	*Sea temp Number*	*Observation*	*Specimen*	*Remarks*	*Spec. No*
1950	19 07 N	77° F	1 Net	Copepods		—
19th Oct 0800	111° 07 W	98	at 10 fms			
19th Oct. 1800	19 20 N 111 12 N	77° F 99	ditto	Nil		—
20th Oct. 0800	21° 41 N 111° 43 W	77 1 100	ditto	Nil		—
20th Oct 1800 1900	ditto	77° F 101	Hand Net Surface	Many Munid Crabs	These observations were made in presence of L S layer	101
		102	1 Net 20 fms	Calanus like Copepods and Brown	which appeared at 150 fms and rose to 20 30 fms as sun set	102
		103	Stramin 40 fms	Large Munid Sagitta Medusæ and Copepods	Sea was carpeted with Munid Crabs	103
21st Oct 0630	23° 51' N 112° 59 W	77° F 104	Stramin 120 fms	Euphausids Sagitta Pteropods and Pleurobrachia	F S Layer	104
21st Oct 1820	24° 24' N 113° 31 W	77° F 105	Stramin 35–50 fms Slow recovery	1 large Munid Sagitta and Euphausids	Munid ate most of remainder and shed four claws at death L S Layer	105
21st Oct 1840	ditto	106	Stramin 20–35 fms Quick recovery	Medusae Sagitta Cylindrical jelly fish	F S Layer	106
22nd Oct 0600	25 58 N 115 12 W	63 F 107	Stramin 50 fms	Pteropods Sagitta Tomopteris Jelly Fish	E S Layer Foregoing and succeeding observations have been separately reported with Records of Secchi Disc	107
22nd Oct 1800	26° 23 N 115° 32 W	63 F 108	ditto	Cylindrical Jelly fish Ctenophores Euphausids Sagitta Medusæ Copepods	Photometer and etc concurrently	108
22nd Oct 1900	ditto	63° F 109	Stramin 55 fms	As above and more Euphausids	F S Layer	109

HEALTH AND EFFICIENCY IN MEN OF THE ROYAL NAVY UNDER THERMAL STRESS

BY

Surgeon Commander C. P. COLLINS, R.N.

The Navy in the Tropics

The tropics have always had an unenviable climatic reputation of intense humidity of alcoholism of exhaustion of body and mind and generally of discomfort above the level normally found in more temperate regions.

The naval officer despatched thereto expected an interesting but uncomfortable commission and formerly there was a widespread impression that to be appointed to stations such as the Persian Gulf was the result of having displeased Their Lordships in some way. For the juniors there was the compensation of occasionally having one's own command even if that merely consisted of a small boat and a party of overheated sailors with whom one lay in wait for the slave dhows. It sounds a far cry from these days but slaving certainly existed till recent years. In 1934 a slave paddled out to the ship in which I served and asked for manumission—he had to be helped on board as his ankles were fastened with an iron bar eighteen inches long and weighing several pounds.

MacDonald Critchley (1945) states that there is a common belief that after a year in the tropics there is a noticeable deterioration in drive, alertness, keenness, memory, capacity and speed of thought and power of making decisions. These symptoms are often accompanied by lassitude, procrastination and slovenliness and are noted to others while not always in oneself. A newcomer is struck by certain traits in those who have served on the station for some time, which may appear in the form of undue irritability, alcoholic indulgence, mild hypochondriacal preoccupation or a tendency to paranoid feelings of resentment. He diagnoses it as probably of the neurosis with hysterical features motivated by a strong if thinly veiled desire to return home. I can certainly recognize some of my shipmates within this description and remember clearly that during the seasonal hot weather everything seemed more unbearable and one's relief seemed an impossible distance in the future. But discomfort was simply something one had to endure for a given period and the normal peacetime duties did not often call for more physical effort than could reasonably be afforded. But even in those days the future sometimes cast its shadows before, as when tests were made of the operative efficiency of the crew in the event of gas warfare. It was a strain to wear masks even on the upper deck and in the engine room it was impossible.

The years passed and improvements in design appeared but the eyes of the naval constructors were upon the waters of the Atlantic and the North rather than on the hot seas to the South. When war came this tendency increased until we heard of Pearl Harbour and the focus began to change.

Wartime Conditions

The war brought ever increasing obstacles to the health and comfort of the ship's companies spared for the Eastern Theatre. Apart from the obvious drawbacks of constant danger, nostalgia and anxiety for one's family, long periods at sea in acute discomfort and scanty shore leave, the ship itself became less habitable. Increased defences cut down daylight and fresh air, increased armament reduced the few open spaces. More men on occasion to the extent of a 60 per cent. increase in complement, more gadgets, black out precautions and full power manœuvring bringing with it still more wind heat—all these increased the strain.

High angle armament and radar equipment were crowded on board to cope with the air and submarine menace. Danger of fire required the removal of woodwork and took away the lagging and insulating lining to the ship's side. Damage control was instituted and the ship already divided into a number of air watertight compartments, became battened down on entering dangerous waters. For long periods at a stretch men remained closed up at first or second degrees of readiness and ventilation suffered. Magazines and ammunition handling spaces were sealed in action to prevent a flash igniting the contents, and in these times circulation of air ceased. That such conditions were had for the crews was fully realized, but in those difficult days the preservation of the ship was the only criterion.

In 1943 many reports were showing that this very severe thermal environment would be likely to interfere with the fighting efficiency of the Fleet if prolonged operations were undertaken. In spite of their individual toughness and endurance, it was becoming increasingly obvious that the men could not retain their health and vigour while living for extended periods between decks in the tropics under wartime conditions. The Admiralty recognized a host of problems confronting them, on the solution of which must depend the whole conduct of the war with Japan. To withdraw vessels in order to adjust their ventilation systems would mean putting urgently needed fighting ships out of action. To reduce heat in other ways could only be achieved by lowering the safety precautions to an extent that might jeopardize the ship. A speedy answer was required, but on more complete information than was available. Science had been called on for its opinion over many years, even as regards warships in hot climates, but never before with so much at stake.

The Changing Views of Science

The plenum system of ventilation had been introduced into ships in the seventies of the last century, and Reid (1884) had laid down that the ensuring of good air movement was of the greatest importance in warship compartments in the tropics and had related the thermal variables to human comfort in a manner closely akin to present thought. Haldane (1901) stated that the wet bulb temperature is the limiting factor of the environment which determines the ability of man to retain thermal balance in his surroundings, and that this limiting factor rises as air movement increases. He declared that the upper endurable limit for men in hot climates was 88° F. wet bulb temperature in

still air and 93 F with air moving at 100 ft. per minute. McCullumb, Houghton and Yagloglou (1924) considered the figure to be 101 F in still air and 96 F with air moving at 200 ft. per minute.

An Admiralty conference on ventilation made its report in 1914 when they laid down that air in living spaces must never contain as much as 0.12 per cent of CO_2, while a supply of 3,000 cu. ft. of air an hour per man was demanded. But though punkah louvres had come into use in 1912, these standards could not keep pace with the alterations and addition to men and machinery over the next twenty-five years.

Hill (1913) in his famous series of experiments had disproved both that lack of oxygen or excess of CO_2 was the cause of discomfort in a saturated atmosphere and shown that the real culprit was heat stagnation. With a still atmosphere and a high degree of humidity the air within the clothing becomes warmed to body temperature and saturated with moisture. If air is held motionless against the skin no further evaporation is taken place, so that heat and discomfort become intense. If by movement of the air the humidity is reduced, since this stationary saturated air is removed, fresh air not at body temperature can take its place and not holding so much water vapour will aid evaporation and cool the body. In the tropics to obtain this effect is the chief aim of ventilation, as where the air temperature may be above that of the body, thermal equilibrium depends entirely upon the evaporation of sweat, for the heat loss due to radiation, convection and insensible perspiration is no longer enough to stop the body temperature from rising.

The concept of thermal equilibrium has been gone into much more fully of recent years. On exposure of the body to heat the temperature rises exponentially but rapidly reaches a fresh equilibrium provided that the external conditions are within adaptive capacities of the human system. The body temperature is thus established and is kept holding maintained at a higher level, i.e. body temperature is maintained at an equilibrium but at the expense of thermal comfort. Apart from this irrespective of external thermal conditions the body of the average adult produces some 400 British Thermal Units of heat an hour even while resting and up to six times this amount while engaged in heavy muscular work.

Houghton and Yagloglou (1923) found that at 64 F. the dry and wet bulb temperatures were of equal importance. Below that point the dry bulb temperature was more important, while above it the wet bulb was more significant. In other words above 64 F. more humidity made one feel hotter while below it more humidity made one colder.

In 1937 also another Naval Ventilation Committee sat and cut the air supply standard to 1,500 cu. ft. per hour per person. They also recommended that hammocks should be slung head to foot so that there would be at least three feet between faces. Air conditioning was discussed but considered impracticable and not essential.

Investigations in Industry

Meanwhile observations from industry had given some indications of the

environmental limits at which disability begins to appear in working men. Vernon (1919) showed that the accident rate was affected by the thermal environment. He noted that accident frequency in a large munitions factory increased by 25 per cent in temperature above 75° F. This was followed up by Vernon Bedford and Warner (1931) who showed that in coal face workers employed in seams where the temperature was 80° F. or more there existed an accident rate 70 per cent higher than in those working below 70° F. while for temperatures in between, rates were intermediate. Fatigue increases the liability to accident and the influence of temperature on the incidence of accidents is presumably a reflection of the fatiguing effect of severe work at high temperature.

Similarly Vernon Bedford and Warner (1927) found that in coal miners speed of working diminished with increasing temperature so that when the wet bulb temperature was approximately 88° F. the working efficiency was reduced by over 40 per cent. This is also shown by records of the heavy industries and their seasonal fluctuations of output.

Even in less severe work excessive temperatures affect industry. Weston (1922) noted that in linen factories the output began to decline with temperatures over 73° F. Wyatt *et al* (1926) found this applied to cotton weaving too, even though warp breakages were less in the moister atmosphere.

On the other side Davies (1922) demonstrated the effect of drying and cooling the air in mines in Brazil. After air conditioning had reduced the wet bulb temperature from about 90° F. to 80° F. the output of gold was raised 12 per cent and the accident rate lowered by two thirds.

New Problems of the Eastern War

Most of these earlier studies, however, were indefinite or lacking in information on certain vital points, or had been carried out in conditions far milder than were being experienced by the Fleet. No one was definite about the upper limits of tolerable warmth as complicated by ship board factors and especially in closed spaces. No one knew the effect of sustained high temperature on skill, mental acuity, or on heavy work that must be done with a degree of accuracy. Something had to be learnt about the optimum speed, duration and intensity of effort in heat over short periods or prolonged, the effect of clothing, the individual's fitness and body size, his water and salt intake and his degree of acclimatization, and the condition in which he finished the allotted task. Finally, the effects of variation in air movement had to be enquired into, as also the incidence of heat exhaustion and of other diseases brought about or enhanced by such conditions, and the best way to apply the knowledge gained to ventilation and air conditioning.

Their Lordships called on the assistance of the Medical Research Council, and the Royal Naval Personnel Research Committee of that body formed a Habitability Sub Committee to go into these matters. The problem, as Sir Sheldon Dudley put it, was to find out what was the ratio of the space allotted to the human element to the space allotted to the mechanical element of the

total fighting machine (ship plus ships company) which [illegible] is far the most efficient engine of war

To compare observations from all over the world, it was essential that standard methods of measurement should be laid down and Bedford (1946) produced a memorandum on technique that was adopted by the Admiralty All ships working under tropical conditions were instructed to produce records of their climatic environment and cabinets containing all the necessary apparatus were issued The thermal factors requiring measurement were air temperature air velocity radiant heat atmospheric humidity and atmospheric freshness but the mechanical methods of procuring these measurements cannot be gone into in this article

Comparison of Thermal Environments

These thermal factors as a whole form one of the most important and as regards the tropics most intrusive parts of the environment And it is as a summated whole that they must be considered so that it has long been felt necessary to express this total effect by a single index The actual sensation of warmth is contributed to by all the thermal variables and no scale that does not take each one into account is adequate to measure the conditions near the Equator

Some consider that the wet bulb temperature by itself gives one a good representation of the total effect

In Great Britain the scale of equivalent temperature is used by heating and ventilating engineers but it is not useful in the Royal Navy

The effective temperature (E T) of an environment is a quantity derived in practice from charts (based on American experimental work) which provides a simple measure of the subjective warmth effect to be expected in that environment taking into account air temperature humidity and air movement but neglecting radiation The charts are made so that if the dry bulb and wet bulb air temperatures are known and the air velocity the E T can be read off directly

The E T refers to basic conditions of still saturated air Thus the E T for a given environment found from the chart might be 78° F (though the dry bulb air temperature might only be 70° F) This would mean in practice that persons in that environment would feel the same subjective sensation of warmth as in still air saturated with moisture at 78 F

The corrected effective temperature (C E T) is a refinement of the effective temperature, consisting of a correction for the effect of radiant heat This correction is made by taking a temperature reading with a globe thermometer and applying this value instead of the dry bulb value to the appropriate chart

Interim Reports and Further Experiments

Reports from the ships began to come in along the desired lines and were supplemented by the experience gained in a visit to the Fleet at sea by McDonald Critchley and Holling in 1944 They concluded that atmospheric

conditions in H M ships often exceeded [illegible] limits and drawn [illegible] the upper limit of habitability including those [illegible] personnel who [illegible] well was carried on to an extent that the fighting efficiency was seriously threatened But they were also able to show that while the increase in mechanical fighting power had worsened the living conditions on board correction of certain structural defects of a nature not requiring a full refit and the better use of equipment already provided could do a lot to correct this Some temporary improvement was made and designs for ships under construction were reconsidered

Meanwhile experiments were continuing in America and the United Kingdom Under the auspices of the Medical Research Council two large hot rooms were constructed in the National Hospital in which full control was possible of the wet and dry bulb temperatures and the air movement Within these conditions were created closely related to actuality Dummy breeches for 6 in and 4 in guns were erected with loading racks and imitation cordite charges etc Under set conditions of all possible varieties likely to be met in the tropics volunteers were given the job of loading ammunition and the effects studied In each case full acclimatization was arranged beforehand and as a result of this graduated introduction into work in unusual heat the volunteers were found to be giving as good or better results as judged by the executive from their loading performance as the men actually stationed in the East

In a work period of four hours from 14 to 18 pints of sweat were lost, and between 21 and 27 grammes of salt Body temperature at times rose to 103–107° F and under the great strain imposed both heat collapse and heat cramps occurred The tests showed that performance deteriorated when subjects were first exposed to work in that heat even though acclimatized but dexterity returned on perseverance over several days Thus practice in work in hot climates as well as acclimatization is of value

Acclimatization

Of considerable importance is the improvement in performance that accompanies acclimatization Even before the war Crowden in the London School of Hygiene and Lee in Australia were engaged actively in research through climatic chambers The war brought tremendous incentive into this field especially when it began to spread to the torrid zones Apart from investigations in the field in Africa Burma New Guinea, Central America and elsewhere British and American teams used these hot rooms They showed that repeated short term exposures resulted in better functioning of the cardio vascular and heat regulating systems coupled with an increased capacity for work Improvement occurs steadily over the first four to eight days and continues at a decreasing rate for a further ten or more Standardized tests made under controlled environmental conditions show that Europeans can be brought to a state of acclimatization quite as good as a negro mine worker

It is worth noting that Machle (1946) expressed the opinion that heat tolerance drops off after the age of 28 If this were the only factor it might

suggest that responsibility in the tropics should be borne largely on the younger officer, while it not that experience and personality are so overwhelmingly on the other side.

Certainly the need for acclimatization was not always realized in the war. On one occasion I was called urgently in the scene in Egypt where a General had decided to give his new draft experience of a day's manœuvres in the desert. Accordingly these young men recently arrived from England had marched off about 7 a.m. into the grim barren and completely shadeless hills and prepared to manœuvre. Their water bottles were empty by noon and about 3 p.m. they began to collapse. When an agitated staff officer brought the news to us a medical officer in the scene it looked rather like a battlefield. Suffice it to say that manœuvres were abruptly cancelled and the victims returned to a tolerably menus available. Of the 140 engaged over [illegible] required treatment and about 27 should be considered degree of exhaustion. No doubt this experience could be duplicated by many medical officers.

Continuation of Studies on the Upper Limits

The Medical Research Council Climate Unit studied the accuracy and suitability of the effective temperature scale under heating environmental conditions. The main variables were the dry and wet bulb temperatures, the air movement, and the nature and amount of work and clothing. They found that the loading at certain temperatures by the wet bulb reading was too low and that insufficient attention was paid to effects of radiation. Air movement at different effective temperatures improved efficiency, but too great an increase in velocity lowered it.

The Royal Naval Personnel Research Committee also recommended that for men in the tropics doing moderate work and wearing normal clothing the upper desirable limit should be taken as 80° F. corrected effective temperature and 86° F. corrected effective temperature as the upper tolerable limit. There are, however, many service conditions where both these limits are exceeded.

A wide range of wet and dry bulb temperatures and air speeds was covered during these tests and the criteria of physiological response were the pulse rate, sweat rate and rectal temperatures, which an observer assessed the state of fatigue and the ability to go on working.

Tests suggested that the teaching on the subject of water and salt intake was incorrect. A man should drink during work if he feels thirsty and water in be of unsalted water. The human body is quite capable of compensating for the increased salt loss in sweating by steady reduction of salt output from the kidneys. Also it is not wise to give large doses of salt as in capsules, before heavy work. It is not helpful and it may cause gastro intestinal disturbance.

Adolf (1946) supported Hubbard's original method of defining heat limits spheres in terms of the wet bulb temperature. He said the wet bulb temperature is a useful index in intolerable conditions. Temperatures above 90° F. can rarely be endured indefinitely, and during work the intolerable temperature may be as low as 80° F. or less. He also indicated the effective temperature scale as an accurate index of physiological stress.

But these investigations were of conditions endured for relatively short periods. To live for months or years in too hot and humid a climate must have an effect on health and efficiency beyond anything that can be displayed in so brief a time.

Machle (1946) advocated 90° F. wet bulb temperature as the maximum endurable and 2–3 degrees less if the subject is clothed.

While the activity and experiments as to the physiological reactions were progressing, the psychological effect of exposure to extremes of temperature had been studied in Cambridge under Bartlett (1941). His work on fatigue resembles and supports the earlier views quoted as to the effect of effort and residence in hot climates. He points out that the threshold range may become raised without it being realized that timed response is increasingly inaccurate and that the subject's insight grows more and more defective. He becomes worried, irritable and obsessed with his physical discomfort but remains unaware of progressive inefficiency.

In 1946 N. H. Mackworth published a most interesting paper on the effects of heat on the human body with special reference to conditions in H.M. ships. By the use of a laboratory hot room he had sought to discover if there was a point at which all human performance deteriorated or if some processes showed this earlier than others. This was of importance in the allocation of air conditioning. He also examined the relationship of effects assessed physiologically to those assessed psychologically. The experiments were of five different types and covered heavy physical effort, high speed semi automatic work, hard thinking to give a purely mental angle, dull and monotonous work, and restlessness while asleep.

It was concluded that the critical regions of room temperature at which work deteriorates and sleeping is less restful is from 83–87.5° F. effective temperature with a wind velocity of 100 ft. per min. Also that very highly trained men suffer less from climatic effects than those of ordinary ability.

It must be remembered, however, that the performance in these experiments was by young and fit men and that average men of all ages should not be bound too closely to this degree of efficiency in such climates as a routine, especially over the period of a full commission.

Improved Conditions with Better Ventilation

Where the installation of a better system of ventilation was possible, conditions of living comfort, and hence of health, improved out of all recognition.

Logan (1944) reported his observations on the crews of two submarines operating from Trincomalee. One with ordinary ventilation gave in the course of a tour of duty a record of prickly heat in every member of the crew, four with heat-stroke and ten with swollen ankles. Efficiency was assessed at 60 per cent. of normal after a thirteen hour dive. The wet bulb temperature on the surface ranged between 81 and 83° F. and at the end of the dive stood at 93° F. Another like submarine after air conditioning and under similar circumstances had only 14 of the crew with prickly heat, no heat collapse and only one with

swallow [illegible] During thirteen hours submersion the wet bulb temperature was 76 83 F and conditions were pleasanter than on the surface

But general air conditioning unfortunately appears impossible To put such bulky and heavy apparatus into the already too scanty space available would be difficult and would certainly lower fighting efficiency by demanding a compensating loss of other equipment

Post war Reports

Ellis (1947) reports that in a survey of eleven warships of the Eastern Fleet the average effective temperature in living spaces was 84° F and in working spaces 88 7° F In some compartments it was as much as 93° F Mean radiant temperature was at times 70° F above the air temperature and in 30 per cent of the compartments where measurements were taken was between 120–150° F When closed down for sea some workshops galleys and machinery compartments were intolerable except for short periods with C E T s of from 95–100° F

An examination of the available space per man showed that 69 per cent had less than 150 cu ft for self and belongings and 92 per cent had less than 200 cu ft As the deck head was usually 8 feet high the majority had a floor space of 19 sq ft Satisfactory air hygiene was maintained by ventilation trunks below decks with powerful fans supplying fresh air to compartments, and others drawing stale air away

Sickness in the Tropics

Naval statistics of sick and attending lists in recent years have shown considerable effects from service in tropical waters Compared with ships in temperate areas the rates are markedly advanced Roberts (1948) in his study of sickness returns from H M ships shows the ratio to be 2 to 1 In the case of skin conditions it was 3 to 1 and this despite the relatively high incidence of skin troubles even in home waters He traces the effect of leaving cooler Australian waters for the tropics in two ships that spent eighteen weeks there In that period there was a relative rise from a standard 100 to 184 on the attending list and 173 on the sick list Two other vessels reversing the journey dropped similarly to 100 from 187 and 173 respectively

Ellis states 9 men out of every 100 during his 1947 survey were attending the sick bay each month with skin trouble Other investigations have shown that skin conditions become twice as prevalent when the effective temperature is over 84° F Defective sweating from chronic prickly heat contributed to the high incidence of clinical and subclinical illness in troops in the Persian Desert (Ladell *et al* 1944) and also to the Navy s reduced ability to resist high temperatures without a possible loss of efficiency

The psychiatric effects have already been touched upon In this connection Cameron (1941) compared the admission to hospital in a shore based community at Bombay with those largely living in ships at Trincomalee 7 per cent of all those admitted at Trincomalee were neuro psychiatric in origin and he computed 40 per cent of these were showing reactions to heat In Bombay the ratio was only 10 per cent

Trends in Disease and Health

To demonstrate the trend in the incidence of conditions that have in some extent been influenced by the climatic environment, seven diseases or groups of diseases as displayed on the East Indies Squadron have been chosen from the statistical tables of the publication "Health of the Navy." These seven dysentery, tuberculosis, mental conditions, respiratory and digestive diseases, connective tissue and skin diseases and injuries were selected, partly because they seem to have a particular association with monotonous and trying commissions in hot and humid climates, and partly because these seven can be followed back through the years. In others when they have been traced to 1890 or so, they become combined or confused under the headings of eruptive or continuous fevers etc. while these flow in unobstructed channels.

Four different periods are shown, and in each case an average over several consecutive years has been taken to give a relatively broad picture of the time and one that is not thrown out of proportion by some temporary circumstance. The periods are at intervals of twenty years and between them they may be said to give a panorama of naval health over the last eighty years. Thus 1887–92 will cover the days when sail was still in use, whilst 1908–12 saw the times when small boats lay in wait to arrest the arms traffic and the new Navy was being formulated. 1928–32 was the transition period to oil burners and one in which the author had a personal interest as a newly joined officer. Finally we have 1948–51, the post war years, and the arrival of the best conditions of warship habitability so far obtained. The latter are not as yet published and the author is indebted to the Medical Director General of the Navy, Sir Alexander Inglehy-Mackenzie, for permission to use them and to Mr. F. E. Smith of the Royal Naval Personnel Research Committee of the Medical Research Council for his assistance.

Throughout, the author has taken similar figures for the Home Fleet over identical periods, which may be considered to give an indication of the incidence rate in the seven chosen groups of diseases under normal naval conditions, with comparable medical skill in temperate climates. The figures given are numbers of cases per 1 000 men and the average number of sick daily. This allows for the difference in size of the fleets, and any excess shown by the East Indies Squadron over the Home Station would seem largely due to the climatic environment.

The numbers involved in the East Indies—a region that stretches from Penang to Suez and from Basra to Zanzibar—have always been approximately the same. In 1893 the Squadron consisted of 4 cruisers, 4 gunboats, 1 coast defence ship and 1 special service vessel. The naval personnel were 2 050 and the number of cases of disease and injury entered on the sick list was 2 652, giving a ratio of 1 293 per 1,000, which was noted as showing a decrease of 582 per 1 000 on the previous year. 8 died, 66 were invalided and the average ratio of men off duty daily was 47 per 1 000. 34 cases were attributed to the effects of climate and heat, and 5 to insanity.

In 1913, in the same waters, there were one battleship, six cruisers, three sloops and one special vessel in addition to a number of armed launches and

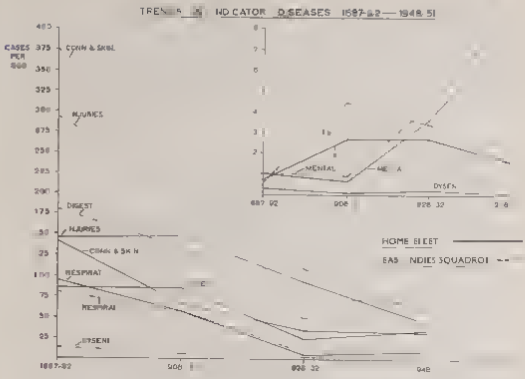

FIG. 1

other small vessels employed in the Persian Gulf in suppression of the arms traffic.[1] The man force corrected for time was 2 500 and cases of disease or injury were 2 495 or a ratio of 998 per 1 000. There were 27 deaths, 11 invaliding and men off duty daily were 33 per 1 000.

By 1933 the ships were back to four cruisers, four sloops, two auxiliary vessels and the same special service vessel. The total corrected complement was 2 405, with 1 463 cases of disease or injury, giving an average of 609 per 1 000. By now the daily ratio of men sick was down to 19 per 1 000.

The figures for 1948–51, though not yet published, were extracted for the author from among the Annual Journals of those years, and the calculation of equivalent ratios was made by Mr. Grant of the Medical Director General's Department, through the kindness of Surgeon Captain Proctor, A.D.G. (H). 1952 figures are not available as Nosological Tables in the Journals were abolished at the end of 1951. The fleet varied in strength and only those ships were taken whose numbers could be extracted, and those again were originally divided into those that were air conditioned and those not. Unfortunately the numbers of the former group were inadequate so that the total ratios given are for all the crews under observation, ranging up to 1 898 in one year, and less in others.

When one comes to consider the table figures and the graphs drawn from them, a number of interesting points emerge. The general downward trend

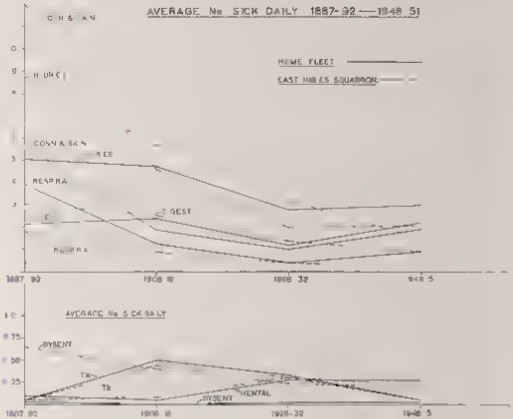

FIG 2

in both sections was to be expected and it is made very clear how much higher the incidence of each indicator disease is in the tropics

Dysentery while fairly prevalent in the early days in the East Indies dropped steadily thereafter till the last period when it again rose to nearly 6 per 1 000 In the Home Fleet it has never been of much consequence in the last century

The small figures for tuberculosis in both fleets in the 1890 period do not inspire the author with confidence The sudden rise to the neighbourhood of 4 per 1 000 in the south and 2 in the north cannot be ascribed to worsened conditions but probably to better diagnosis In 1948–51 figures of 1 65 per 1 000 men in both stations were shown

In mental disease the trend is the reverse to what is seen in other groups Starting at a low level (also possibly due to uncertainty as to when eccentric behaviour ended and mental disease began) it rose suddenly in the 1930 period and continued to rise in 1948–51 Is this due to the increasing stress of modern days or to a readier perception of our neighbour's mental discomfort? Both at home and abroad the numbers have risen so while the East Indies still leads it is obviously a problem that concerns the Navy as a whole and not only that part of the tropics

Respiratory diseases were taken as including bronchial catarrh bronchitis asthma fibrosis of the lung, pleurisy and other diseases including the pneumonias This was the only group showing one occasion of greater incidence in the Home Fleet but after 1890 the position quickly altered and by 1930 the East Indies showed a figure nearly double In 1948-51 there was a considerable rise on both stations of about 65 per cent in the East Indies and of 100 per cent in the Home Fleet

Injuries may have been affected by many circumstances. These included both general and local injuries and though those due to hostile action were excluded undoubtedly in the East Indies more time was spent in boats and under conditions where injuries were more liable to occur In the Home Fleet they kept level at approximately 145 cases per 1 000 for the first two periods falling slowly thereafter In the East Indies starting at nearly 300 per 1 000 they dropped to a position not greatly exceeding those in the Home Fleet There is still an excess and in view of the effects of hot environments noted earlier on accident proneness it is to be expected

Digestive diseases and those of connective tissue and skin give the most striking examples of all The former includes all diseases of the stomach intestines, liver and gall bladder rectum and anus while the latter group covers abscesses boils eczema, impetigo and others of similar nature

In the East Indies the incidence of skin conditions is always double and in digestive troubles nearly always double that found in the Home Fleet In both stations and for both groups the incidence is dropping save for a slight rise in digestive disease for the Home Fleet in the last period It still remains far too high however both as regards the other nosological conditions and the relative incidence in civilian life

In general especially in recent years with the comparative facilities of treatment and disparity of numbers between the two stations, the author feels the number of cases per 1 000 men per year gives a truer picture than the average number of sick daily

Coping with the Thermal Environment

From these records covering a period of over eighty years I think it can be accepted that conditions for working relaxing or sleeping in H M ships in tropical waters are both less comfortable and more conducive to loss of health, than those on other stations

Investigations have shown that a corrected effective temperature of 80° F is the upper desirable limit over any length of time and that 87 5° F should not be exceeded without expecting, and allowing for an eventual loss of efficiency Furthermore such limits were set having regard to experiments lasting three to four hours at most and the long term effect of a corrected effective temperature between 83 and 87 5° F has never been accurately estimated

Amelioration it would seem must be attempted and only three avenues of approach present themselves

(1) *The Period of Exposure.*—The author remembers himself how much

more the second year weighs upon one's spirit than the first One is not so resilient either physically or mentally, and it would be most interesting if one could follow up statistically the relative incidence of psychological digestive and skin conditions for instance in the first and second years of a tropical commission The author cannot but feel that there would be a significant increase which would be more marked still if the period were further extended It is obvious that relefs must depend on the exigencies of the Service but the author feels that two years actually on the East Indies Station should not be exceeded if it can be prevented Certainly this has been advocated time and again and was strongly emphasized by Woodruffe as far back as 1905

(2) *Periods of Recuperation*—Docking and refitting are allowed where possible every six months and to get the men away from the ship to a different environment is of vital importance The improvement shown in health and spirits on their removal from Colombo or Trincomalee to Nurwara Eliya is a case in point—and it would be of the greatest value if such arrangements could be made elsewhere

(3) *Structural and Lesser Changes*—It is obvious that such are required in all save ships specifically built for the tropics, further that it is not merely a matter of putting in another icebox and a few more fans, but alterations and additions on the grand scale and on the advice of experts Before a ship is despatched to such climates for a commission enough time should be allotted for proper preparation after an exhaustive examination of all sources of wild heat as well as of the ventilation system as a whole

(*a*) Air conditioning is naturally the first improvement that occurs to one, but its installation presents new difficulties Its bulk its weight and its cost are all strong arguments against general adoption, very great though its advantages would be

(*b*) Siting of intakes and exhausts is of the greatest importance A thoughtlessly placed intake may gain much wild heat in the passage to its destination These should all be carefully checked and whenever at fault, corrected

(*c*) Lagging of course is vital It must be adequate everywhere and in good condition It seems probable that a considerable increase in the lagging of the ship's sides and deckhead might prove of value in reducing the effect of solar radiation on the temperature below decks Steam pipes and all heat producing machinery or compartments should be tested with the thermocouple and where the lagging is proved insufficient it should be remedied The newer insulating materials such as the light non inflammable plastics lined with cork sheeting may be found useful both for excluding wild heat from the living spaces and as additional precaution against fire risk

(*d*) Experiments were carried out in the U S N recently to study tolerance limits for personnel and protective measures against high levels of heat and humidity They took place in the engine room of a naval vessel where the normal high working temperatures were raised by cutting off ventilation Conditions were very severe, reaching effective temperatures of 115° F and the test had to be cut short, owing to the need for quick relief of those on duty

and the eventual shortage of personnel The principal sources of radiant heat were found to be bare fitting valves, flanges etc which are difficult to insulate while others were the turbines pumps generating equipment, auxiliary machinery and the high pressure steam lines The principal sources of excessive moisture in the machinery space were steam leaks from turbine and pump glands funnel traps valve steams and the flange gaskets of high pressure steam lines and the leakage was estimated at 457 lb an hour at least It was this water vapour rather than the sensible heat that made the space untenable soon after the ventilation was cut off

Preventive measures recommended were

(i) Improvement of packing glands to reduce steam leakage to the minimum necessary for gland lubrication This of course lowers both temperature and humidity

(ii) More effective insulation of hot surfaces especially those indicated as principal sources

(iii) Insulating clothing gave some protection against high external heat and allowed condensation of atmospheric moisture to take place away from the skin

(iv) The load imposed on the heart by standing or working in the heat justified the use of stools whenever practicable

(e) An increase in the air velocity is a very practical measure and one of the easier to arrange It certainly is remarkably effective Normally below decks air is driven by electric fans through trunks by means of the blower system, and forced via punkah louvres into the various compartments This gives the benefit of spot cooling if desired In the compartments themselves are small electric fans and a forced exhaust system is used as well in regions such as the heads or ablution rooms where the air requires rapid removal The greater part of the improvement in habitability hitherto in ships in the tropics has been due to increases in the numbers range and extent of these methods

(f) The effect of colour in personal sensation has been under investigation since the war and paint of the correct colour and composition might be of considerable assistance in reflecting solar heat before it penetrated the ship s sides I cannot altogether conceive of their Lordships allowing H M ships to be coated with aluminium foil even with this praiseworthy object in view but possibly glossy white of the variety more commonly associated with private yachts, would not perhaps be quite so far out of the question in tropical waters and in times of peace Certainly applied to a ship s side and upper works it would go a long way to maintaining a relative coolness within for this has been proved in tropical housing experiments

Aluminium foil as a protection within the ship itself is even more helpful Its lack of emissivity (·04) would give almost complete protection below decks from the sunrays and external warmth striking in through the sides and deck Experiments have shown the remarkable effects of this material in reflecting heat away, and further investigation in ships or shore establishments might lead to outstanding improvement in the comfort of the occupants

(*g*) Fluorescent lighting might also be considered The heat given off by this method of artificial lighting is considerably less than that from the older and less efficient electric bulb

(*h*) Laundries and drying rooms are essential for all ships stationed in hot climates The increase of cleanliness and the comfort of crisp clean clothing is to be desired, and so is the removal of sweat soaked garments from the mess decks All three will do much to maintain the comfort and general well being of the crew

(*i*) In any case no ships should be allowed to proceed until the whole internal thermal environment has been tested Obviously it is better to discover unsatisfactory conditions and to remedy them at once than to wait until the ship is on its Station Of considerable importance in this respect is the method of prediction formulated by Gray and Smith (1952) By this means can be foretold while one is still in Home Waters the thermal conditions to be expected within the ship when in the tropics They showed that the total heat content of the air of a ship s compartment always exceeds that of the outside air by a constant amount, further, that this total heat gain is independent of the temperature and humidity of the outside air, provided the ventilation remains unchanged Thus if these differences are measured several times a day in harbour and at sea their mean and standard deviation can be calculated

An analysis of the temperatures on foreign stations was produced by F E Smith and C R Underwood (1949) and from this the wet bulb temperature to be expected can be selected and converted into total heat content using hygrometric tables If to this is added the mean total heat gain for the compartment during trials the wet bulb temperature most likely to be found under the selected climatic conditions can be estimated If this final figure is higher than the accepted limiting temperature action can then be taken to remedy the situation while the ship is still in dockyard hands What such action is to be in the future rests of course with the Admiralty

Summary

The effect of hot climates on the mental and physical health of man is discussed with particular reference to H M ships in tropical waters

Experiments and investigations bearing thereon are traced over the last fifty years

Conclusions are stated and suggestions put forward for further improvement of the well being of naval personnel serving under such climatic conditions

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[illegible] and Hu[illegible] **2** 4 [illegible]

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McCuns[illegible] and Vaglogue [illegible] *Heal* [illegible]

Macrae [illegible] *Occ pat* [illegible] 2 4

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Clinical Notes and Cases

A CASE OF TROPICAL EOSINOPHILIA WITHOUT PULMONARY LESIONS

BY

Surgeon Lieutenant W. B. WRIGHT

Tropical eosinophilia remains something of a mystery and we are always somewhat at a disadvantage when faced with the condition depending mainly on the typical syndrome and response to treatment for diagnosis. The following case is of interest in that illness was atypical and the eosinophils themselves were abnormal.

Case History.—Petty Officer Electrician aged 29 was referred to the Royal Naval Hospital Haslar for investigation of recurrent transient subcutaneous swellings during the previous six weeks. He had about a dozen such swellings ranging from ½ in. to 2 in. in diameter and distributed over the face trunk forearms hands and legs. They occurred singly and each lasted for two to three days. The swellings tended to itch slightly but were painless and caused him little discomfort. Otherwise he was perfectly well and symptomless. He had been treated with Phoenergan for one week without improvement at R.N. Barracks Portsmouth.

On admission to hospital he was found to have one such swelling on the anterior aspect of the left wrist a smooth tense warm lesion with a slight erythema and no sharp demarcation. There was no glandular enlargement and the spleen was not palpable.

There were no other physical findings. Chest X ray was clear.

Previous History.—Deesgoe Fever—Bombay 1943. Uneventful recovery. Severe vomiting and diarrhœa—Singapore 1939.

22.7.55. Blood examination revealed W.B.C. count 18,400/c.mm. with 50 per cent. eosinophils.

E.S.R. 21 mm./hr. Casoni Test negative. W.R. and P.P.R. negative.

There was no abnormality in the urine.

The presence of parasitic infestation was suspected and repeated examinations of sputum for ova and ascaris ova and of faeces for amœba cysts and ova were carried out. Only a few *E. coli* cysts were found. Blood films taken by day and during the night were negative for filariæ.

4.8.55. W.B.C. 19,000 with 51 per cent. eosinophils.

A course of Hetrazan (200 mg. b.d.) was commenced as a empirical treatment on account of the possibility of filariasis. After seven days another blood examination showed a rise in W.B.C. to 21,700 with 71 per cent. eosinophils. The eosinophils were all mature but of large size and eosinophilic granules were unusually prominent. The diagnosis of eosinophilic leukæmia was mooted at this stage and a marrow puncture was carried out. This showed nothing remarkable except for the preponderance of eosinophils in all stages of development. Comparison with the peripheral blood showed clearly that the latter contained no primitive cells.

During this time the patient had had swellings in the left leg and foot which had cleared in three days corresponding well with the history before admission.

In the [illegible] thought Hetrazan treatment [illegible] which he continued [illegible] lumps on the forearms each [illegible] diameter He was otherwise [illegible] well In view of the continued [illegible] eosinophilia the patient was referred to the Consultant in Tropical [illegible] Sir Philip Manson Bahr who made a diagnosis of Tropical Eosinophilia [illegible] lesions exhibiting [illegible] urticarial manifestations

Comment

The causes of eosinophilia are many and it may be extremely difficult to select the correct diagnosis in any individual case particularly among naval personnel who may easily have touched port in every quarter of the globe This is a case in point The patient had since 1943 visited North Africa Freetown, French Equatorial Africa South Africa Madagascar East Africa Aden The Persian Gulf Bombay Ceylon Mauritius Seychelles Singapore Hong Kong Japan Korea Pearl Harbour The Panama Canal and Jamaica

Relevant causes other than infestation and tropical eosinophilia were eliminated However a detailed history elicited no recent dietary changes or drug treatment which might have been a source of allergy the swellings came single rather than in crops antihistamine therapy had no effect and he had no past history of allergic states such as asthma eczema hay fever or angio neurotic œdema At no time were the swellings associated with pitting œdema

Throughout the period of observation the patient had no rise of temperature or pulse This taken in conjunction with a normal E S R and the nature of the lesions would rule out erythema nodosum, erythema multiforme polyarteritis nodosa and the manifestations of any acute infection Eosinophilic leukæmia was excluded by marrow puncture

Infestation could not be completely eliminated and the patient had been at one time and another exposed to almost every kind of parasite in theory at least His exposure to the *Loa loa* area in West Africa, however was brief—and twelve years ago The other filariæ could hardly be implicated Cysticercosis could be excluded Acarus infestation ascariasis ankylostomiasis and others remained possible but no evidence to suggest their presence could be obtained Hydatid disease was rendered unlikely by the negative Casoni test and Loeffler's syndrome was simply ruled out by the absence of a lung lesion and the extreme eosinophilia Amœbiasis was unlikely in view of the negative stools and absence of gastro intestinal upset

The diagnosis thus lay between an undetected tropical infestation and tropical eosinophilia

The cold agglutination titre is raised in a high proportion of cases of tropical eosinophilia (Viswanathan and Natarjan 1945)—it was not raised in this case Also tropical eosinophilia (syn eosinophilic bronchitis) is generally associated with a pulmonary lesion ranging from a mild asthmatic state to a severe condition associated with miliary mottling of the lung (Wilson 1947) There was neither a history of respiratory symptoms nor an abnormal chest X ray here According to Manson Bahr (personal communication) however 25 per cent of cases accepted as this disease show no pulmonary signs or symptoms

An allied condition eosinophilic erythrœdema, which has no pulmonary

manifestations were described in Palestine where it occurred in epidemic form (Klopstock and Steinitz 1945) and it seems likely that this man's disease was of a similar type.

The very high eosinophilia and the unusual cytoplasmic granule staining properties are characteristic of the condition (Manson Bahr personal communication). It would seem reasonable to suggest therefore that a careful study of the blood film may be well worth while in other cases where tropical eosinophilia would be confidently diagnosed but for the absence of definite pulmonary signs.

ACKNOWLEDGMENTS

I wish to thank Surgeon Rear Admiral E. F. S. Rudd, C.B.E., for his kind permission to present this case.

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TWO CASES OF TINEA FOLLICULORUM

BY

Surgeon Lieutenant-Commander R. H. BROUGHTON, R.N.

A LEADING stoker and electrician's mate have been seen recently with fungus infection deep in the hair follicles on their backs. The appearance in both cases was unlike the usual picture of ringworm and their case histories are reported below.

Case 1.—Leading Stoker, aged 24.

Four years ago in the West Indies while serving as a stoker in the boiler room (temperature 120° F.) he first noticed an irritating rash on his back and under his buttocks which he thought was due to prickly heat. At the same time he had an acute tinea pedis which he attributed to standing on the hot plates in the boiler room. Each summer since then and also occasionally in the winter vesicles have reappeared on both soles and he has had peeling between the toes.

P.S.H.—No previous skin trouble. No history of allergy. F.H.—Nil relevant.

O/E.—*Trunk.*—There were numerous scattered discrete inflamed follicles on the back of his trunk and buttocks and shoulders (fig. 1).

Scraping.—No fungus found (potash method). *Culture.*—Negative.

Histological Section.—(Stained by acid schiff method). Mycelium is seen surrounding the shafts of the hair follicles (fig. 2).

Left Sole.—There was a chronic scaly tinea present on the inner side of the sole.

Scraping.—Fungus found (potash method). *Culture.*—*Trichophyton interdigitale.*

FIG. 1

Case 1—Electrician's Mate, aged 22

This case was similar in practically every detail. He had a severe [illegible] on his follicular eruption on his back. It began with [illegible] boiler room. He also had [illegible] the soles of his feet at the time [illegible] lungs. On examination there were a number of discrete [illegible] follicles resembling acne vulgaris with no [illegible]. The rash was located on the shoulder blades. Biopsy of one [illegible] follicles revealed [illegible] in the sheath. Superficial scraping [illegible] both [illegible] only [illegible] in this case.

TREATMENT

Both these patients cleared up very quickly on single dressings and finally treble strength Whitfield's ointment rubbed into the skin twice daily under supervision. The skin was watched carefully for signs of [illegible] but none developed. The treatment was gradually tailed off to single strength ointment twice weekly. Irritation disappeared within a few days and the skin was completely normal in both cases in three weeks.

COMMENT

These two cases represent an unusual form of ringworm and bear no resemblance to the usual appearance of tinea corporis, which is described as circinate patches of erythema with central clearing and peripheral activity, and vesiculation. The lesions in these two cases were isolated follicular papules due to invasion of the hair follicles. Cairns (1934) reports that follicular lesions, although described by Lewis in 1930, have only recently received much attention. The lanugo hairs are apparently relatively immune to attack, but coarse hairs are not uncommonly infected and pilar invasion may be of the endo- or ectothrix type. Mild perifollicular erythema, follicular papules, pustules

Fig. 2. Histo section [illegible] descending, around the shaft [illegible] follicles.

necrotic follicles [illegible] cyst or kerion type of nodule may all be seen, depending on the degree of suppuration of the infected tissue. He was referring to infection by the *Trichophyton rubrum* dermatophyte. The two cases at present reported were most probably due to *Trichophyton interdigitale* in view of the

positive culture from the foot lesion in one case. Unfortunately, cultures from the hair follicles themselves were sterile.

Clinically, the eruption most accurately resembled acne urticata, although a low grade acne vulgaris or follicular eczema could be confused with it. It may occur more frequently than suspected and extremes of temperature and moisture are probably necessary to provide suitable terrain for the fungus to flourish. The presenting symptom was intense irritation usually provoked by hot baths, etc. It is most probable infection took place through the dilated pores of the skin via the towel during the attack of prickly heat when tinea pedis was also present. It is likely that oils and greases predispose to fungus infection by removing and destroying the protective keratin layer of the skin at the time of invasion. These infections are highest in the Engine Room Branch and it is not unusual to see palmar as well as foot lesions in these ratings.

As a corollary, the medical documents of 100 ratings taken at random were examined for histories of fungus infections which were found to be very frequent.

INCIDENCE OF CASE HISTORY OF TINEA

40 *Seamen*		40 *Engine room*		20 *Miscellaneous*	
Yes	No	Yes	No	Yes	No
6	34	10	30	2	18

SUMMARY

(1) Two cases of tinea folliculorum of the back are described which were most probably due to *Trichophyton interdigitale*.

(2) Other similar reported cases are due to *Trichophyton rubrum*.

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CAIRNS, R. (1954) *Transactions of the St. John's Hospital Dermatological Society*, page 128.

IMPROVISED SPRAY-JET FOR TUNGSTEN CARBIDE BURS AND DIAMOND INSTRUMENTS

BY

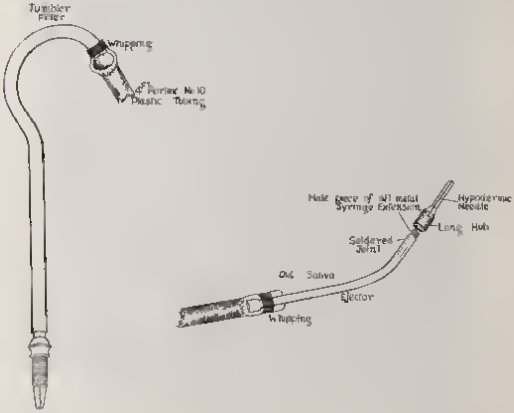
Surgeon Captain (D) W. HOLGATE, R.N.

WITH the introduction into the Schedule of Naval Dental Equipment of tungsten carbide burs and diamond instruments, more efficient methods of cavity preparation are now in general use. For use to their best advantage it is a requirement that the engine should revolve at a very much higher speed than was formerly used with steel burs. This higher speed accentuates the old problem of heat generation in the cavity.

If no local anæsthetic is used for cavity preparation toleration is restricted to very short periods of application which in turn unduly prolongs the time taken in cutting the cavity When a local anæsthetic is used because there is no response by the patient irreparable damage may easily be caused to the pulp

To prevent this overheating cooling of the bur either by means of compressed air atomizer spray or direct water jet is very desirable Recently, dental literature has been enriched by description of several ingenious methods of automatic application of all three of these media to the revolving bur Some indeed most of these methods have been rather elaborate costly difficult to manufacture and obviously needing constant maintenence dets of the type to be fixed to the handpiece make them bulky and view obstructing

The direct water jet is probably the most efficient cooling agent and given the help of an intelligent assistant a very simple apparatus can easily be made to apply it



About 4 ft of Portex No 10 tubing is fixed by means of a silk whipping to the tumbler filler of the Rathbone unit (This tap is seldom used for the purpose for which it was intended) The curved jet should be screwed away from the tumbler holder It is essential to use a flexible tubing with no elasticity in its walls rubber tubing is useless as pressure builds up within it and prevents easy adjustment of the spray

To the other end is secured also by whipping a [illegible] length of ¼ in metal piping (An [illegible] salivary ejector tube serves very well [illegible] The [illegible] made end of a curved extension piece for the all metal hypodermic [illegible] fitted into this tubing

A hypodermic needle is inserted into a [illegible] hub [illegible] that it does not project beyond the end of it The hub can now be screwed [illegible] the main extension piece in the usual fashion

This produces a very efficient and easily managed spray [illegible] flow of water can be adjusted by the tap on the unit The jet should be long enough to be able to be directed on to the revolving bur from well outside the mouth but its flow should not be so copious as to flood the mouth beyond the scope of the salivary ejector

The ease of cutting cavities by this method is remarkable the patient tolerates the operation so much better with it than without It cuts down the necessity of using a local injection in many cases

If an injection is used very rapid cavity preparation can be carried out without the fear of overheating As the debris from the cutting operation is constantly being sluiced away one has not to stop to allow the patient to rinse the mouth so frequently

The number of unsolicited expressions of approval by the patients concerned is noteworthy—all agree it takes away a good deal of the jarring and engine vibration

It has been found that surgery attendants soon become proficient in its use—they like it because it gives them an added interest in their job—they can see what is going on The attendant places his finger on the end of the nozzle when it is desired to discontinue its use

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R N DENTAL EXHIBIT AT THE ANNUAL CONFERENCE OF THE BRITISH DENTAL ASSOCIATION IN GLASGOW

The Director of Dental Studies accompanied by Mr F A McCallum *B Sc M* Demonstrator Dental Technician attended the annual conference of the British Dental Association at Glasgow in July 1951

The background of the R N exhibit showed coloured photographs of Stations abroad The centrepiece was a fluorescent screen showing colour transparencies of Royal Naval dental surgeries ashore and afloat laboratory and operating theatre The colour photography by Mr K Clinch of the R N Physiological Laboratory was of an outstandingly high standard and received much admiration

The minor dental (emergency) valise was exhibited and models in acrylic and soft vinyl resin were on view

The R N film The Treatment of Dental Emergencies by Medical Staffs was also shown to a large audience

Reviews

[illegible]

[illegible]

[illegible]

[illegible] assault on [illegible] enlarged [illegible]

[illegible] has experience [illegible] at the [illegible]

[illegible]

[illegible]

[illegible]

Medical Journal [illegible]
British Medical [illegible]

This book is compiled [illegible] appeared originally in the [illegible] general practitioner.

It deals with clinical [illegible] the facilities available [illegible] and emphasizes that the [illegible] fulfils its purpose [illegible] in helping them [illegible] written as they [illegible] attractively presented.

This volume [illegible] good value for the price.

We acknowledge with thanks receipt of the following publications

Anales de la Facultad de Medicina Montevideo, *Annals of Tropical Medicine & Parasitology*, *British Medical Journal*, *British Medical Bulletin*, *Boletim do [illegible] Brazil*, *Bruxelles*(?) *Bulletin International des Services de Santé*, *Bulletin Tokyo Medical & Dental University*, *Excerpta Medica*, *[illegible] Journal of Medical Sciences*, *Guy's Hospital Gazette*, *Journal of the [illegible]*, *Journal of the Royal Army Medical Corps*, *Journal of the Royal Naval Medical Service*, *Kurume Medical Journal*, *Kyushu Memoirs of Medical Sciences*, *Medical Journal of Australia*, *Medical Press*, *Mie Medical Journal*, *Nagoya Journal of Medical Science*, *Proceedings of the Staff Meetings*, *St Thomas's Hospital Gazette*, *St Mary's Hospital Gazette*, *Sydney University Medical Society Bulletin*, *[illegible] Journal of [illegible] Medicine*, *Tropical Diseases Bulletin*, *University of Durham Medical Gazette*, *United States Armed Forces Medical Journal*, *Ulster Medical Journal*, *United States Medical Technicians Bulletin*, *West London Medical Journal*, *Yokohama Medical Bulletin*.

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News of the Service

OBITUARY

[illegible] REGINALD BOND *K.C.B.* M.B. [illegible] Director General of the Navy 1931–1934. Educated [illegible] 1881 [illegible] This is the formidable Mrs [illegible] [illegible] 1888.

He [illegible] St. [illegible] Wiltshire in 1871. [illegible] M.[illegible] [illegible] 1884. [illegible] student he gained the M[illegible] [illegible] in 1890 [illegible] mounted [illegible] [illegible] Royal Hospital [illegible] the Royal Marines [illegible] Medal [illegible] 1899 [illegible] 1898 [illegible] the Royal Marines. He [illegible] Medal [illegible] Medal in 1902 [illegible] Medal in 1907. [illegible] *Britannia* during the Great War [illegible] the Grand Fleet. [illegible] Director of Medical Services [illegible] Medical Officer of Health of Gibraltar [illegible] Royal Naval Medical School [illegible] Surgeon Rear-Admiral [illegible] Hospital Haslar [illegible] appointed [illegible] Medical Director-General [illegible] the Navy, in 1933 he was appointed *K.C.B.* [illegible]

[illegible] Medical [illegible] the Great War [illegible] 1920 to 1926 he [illegible] Royal Naval Medical School. In 1933 he became [illegible] himself in the hospital organization [illegible] Queen Mary's Hospital Roehampton [illegible] the hospital and treasurer of the [illegible] Benevolent Society.

[illegible] he died suddenly [illegible] he recovered [illegible]

[illegible] RICHARDS R.N.V.R. [illegible] in the Fleet [illegible] in a boiler explosion in H.M. Submarine S.7 [illegible] 1928 he [illegible] at the London Hospital and [illegible] M.R.C.S. [illegible] 1897 and M.B., B.S. (London) in [illegible] 1898. He [illegible] in the London Hospital from December 1898 to March 1899 and [illegible] Harold Wood Hospital, Essex, from June to November 1899. He [illegible] R.N.V.R. was a Temporary Surgeon Lieutenant R.N.V.R. [illegible] of Infirmary [illegible] on 31st December 1903. After short [illegible] H.M.S. Barfleur, Portsmouth, [illegible] appointed to H.M.S. *Maidstone* on the 8th January 1931.

[illegible] first joined the Rhodesia in the summer of 1939 [illegible]

[illegible]

[illegible]

[illegible]

HONOURS AND AWARDS

Queen's Honorary Surgeon

Surgeon Rear Admiral H. T. S. Rudd, *C.B.E.*, M.B., B.Ch., [illegible]

Queen's Honorary Physician

Surgeon Captain A. D. Duncan, *O.B.E.*, M.D., Ch.B., D.T.H.

Surgeon Commander F. V. Williams, M.B., B.Ch., R.N.

Commander of the Order of St. John of J[illegible]

Surgeon Captain A. H. S. C. Runsford, *C.B.*, Q.H.P.

Officer of the Order of St. John of J[illegible]

Surgeon Commander S. C. Wills, *C.B.E.*, R.N.

Serving Brother of the Order of St. John of J[illegible]

[illegible] H. D. Caldwell, R.N.

[illegible] R. Tarrant-Cowin, R.N.

HIGHER DEGREES

M[illegible] S[illegible] [illegible] Surgeon Commander S. M[illegible], M.B., Ch.B., [illegible] D.T.M.&H.

[illegible] Diploma of Medicine—Surgeon Commander C. C. Wallis, M.B., B.S.

[illegible] Diploma of Ophthalmology—Surgeon Commander G. A. Burns, M.R.C.S., L.R.C.P.

[illegible] Diploma of Public Health—Surgeon Commander C. A. Harris, M.R.C.S., L.R.C.P., D.T.H., D.P.H.

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To Surgeon Captain (D): A. W. A. Price.

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To Surgeon Commander (D)—A. Simpson, W. T. A. Watson.

To Surgeon Lieutenant Commander (D)—C. J. Boyd.

TRANSFERS TO PERMANENT LIST

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RE-ENTRY TO THE PERMANENT LIST

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